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The initialled abstracts and reviews are by R. J. Garner, W. G. Keyworth, H. B. S. Montgomery, J. P. R. Riches, and W. A. Roach of the East Malling Research Station.

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N.B.—Figures in brackets denote that the adjacent number contains so many items noted, but not abstracted.

MISCELLANEOUS.

Physiological and chemical studies.

392. KREÏER, G. K. 581.143.26.03: 585/589
The theory of phasic development in plant systematics. [Russian.]
Sovetsk. Botan., 1941, Nos. 1-2, pp. 39-50.

The essential argument pursued in this article is that there is no hard and fast distinction between annuals, biennials and perennials, or between winter and spring annuals; intermediate forms can be found, and one type can be converted into the other under the influence of environment as determined by geographical location and ecological conditions. It is concluded that, in general, a cold severe climate gives rise to biennial or perennial, and winter-hardy forms; and a mild climate to annuals, the seed of which germinates in spring, producing plants which flower in the same year and are not hardy. Lysenko's phasic theory is used to explain how annuals can be changed into perennials, winter into spring annuals, and *vice versa*. Among the plants discussed in connexion with the argument summarized above are the annual and biennial forms of *Hyoscyamus niger*, and some other species of the same genus, *Pyrethrum cinerariifolium*, *Trifolium* spp., *Digitalis purpurea* and *Poa annua*.

393. IVANOV, S. L. 581.145.2
The formative and accumulative stages in the development of fruits. [Russian.]
Sovetsk. Botan., 1941, No. 4, pp. 3-13.

The fundamental problem which the author has in mind relates to the three types of nutrients stored in the seeds of plants—carbohydrates, proteins and oils. The reason for the accumulation of any of these substances must be the subject of biochemical investigation. There is conceived to be a struggle between the pericarp and the seed for possession of the nutrients evolved in other parts of the plant. During the first stage of fruit formation the pericarp draws to itself a larger share. The endosperm of the seed does not begin to acquire its ultimate character until the pericarp and seed have reached their full dimensions which, if large, delay and diminish the storage of nutrients in the seed endosperm. The aspect of the general problem indicated above, which has been the subject of investigation in the present article, is the determination of the time which must elapse after fertilization before the first globules of oil can be discerned under the microscope in the seeds of flax, poppy, sunflower, and castor oil bean. In the small seeds of poppy, oil drops appear within 6 days; the formation stage of *Ricinus*, however, is lengthy and the appearance of oil is consequently delayed. The starch which is present in oil-bearing seeds disappears as the oil content increases.

394. ÅBERG, B. 612.014.44
A physiological and ecological study of the results of photoperiodism in plants. [German.]
Symb. bot. upsaliens., 1943, **8**: 1-189, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 191-2.

The investigation, of which only the results of some of the physiological experiments can be reported, was carried out at the Institute of Physiological Botany, Upsala. The dry weight of young tomato, lettuce and spinach plants and of *Lepidium* seedlings exposed to light of constant intensity for varying periods at a constant temperature was found to increase with the period of illumination, with the exception of tomatoes which were checked by periods exceeding 18 hours. In another experiment with young pea and broad bean plants etiolation was shown to be determined by light intensity rather than by the period of illumination. Light of different sources increased the dry weight of tomatoes, lettuce, spinach and peas in the following order: Mercury high pressure, sodium, neon and incandescent

(+Hg) lamps. With lettuce, the difference between the effect of Hg and Na light was insignificant, possibly owing to its light-green leaf colour. The length of internodes in tomatoes was found to decrease with the series Hg, Na, Ne. A mixed Na-Hg light produced plants of normal daylight habit. Temperature was the variable factor (7·5°-25° C.) in another series of experiments. The author observed that rising temperatures have the same effect as weak illumination and the term "thermo-etiolation" is used. The etiolating effect of incandescent lamps may be partly explained in this way. An insufficient amount of short-wave light was found to cause the rolling up of tomato leaves. The formation of a level lamina seems therefore to require a certain minimum of short-wave light. The ecological experiments were carried out with *Lobelia dortmanna*.

395. SMITH, F. 612.014.44
A preliminary study on the effect of infra-red radiation upon plants. [Norwegian.]
Meld. Nord. Landbr. Høgsk., 1944, **24**: 69-144, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 192-3.

In experiments with lettuce, conducted at the Norwegian Agricultural College, infra-red radiation was found to promote shoot growth and the accumulation of dry matter but to prevent head formation. Special devices for filtering the light and for maintaining air and soil temperature and relative humidity at a constant value are described. Radishes illuminated by incandescent lamps failed to form tubers, probably owing to the small amount of ultra-violet in proportion to infra-red light. When, however, the infra-red rays of very strong incandescent lamps were removed by a water filter which allowed the ultra-violet rays to pass, tubers were formed.

396. DAM, H. 577.16
Vitamin K in unicellular photosynthesizing organisms.
Amer. J. Bot., 1944, **31**: 492-3, bibl. 4.

The investigation which has been carried out at the University of Rochester, N.Y., is a contribution to the problem whether vitamin K plays any rôle in photosynthesis. The results show that the green alga *Chlorella vulgaris* has a vitamin K activity corresponding to 6 micrograms of menadione per g. dry weight. The vitamin K activity of the photosynthesizing *Rhodobacillus palustris*, *R. rubrum*, *R. sp.* No. 10 and *Phaenomonas* sp. was about 0·4-1 expressed in the same terms.

397. BOSWELL, J. C. 581.12
A note on the thermodynamic aspect of respiration.
New Phytol., 1944, **43**: 13-4, bibl. 1.

This note draws attention to one thermodynamic aspect of respiration discussed by Wohl and James in a previous paper, *ibidem* 1942, 41: 230-56; *H.A.*, 13: 679. The author concludes: "The heat liberated in respiration is the final manifestation of the free-energy changes of a large number of separate reactions. These individual changes maintain the orderly progress of the respiration mechanism."

398. KEILIN, D., AND WANG, Y. L. 631.847
Haemoglobin in the root nodules of leguminous plants.
Nature, 1945, **155**: 227-9, bibl. 8.

The authors report on their investigation into the nature of the red pigment in the root nodules of leguminous plants. From an examination of results of other workers it is obvious that the red pigment is a haematin. The present work was to determine whether it is an oxygen carrier of the haemoglobin type. The technique employed and the reactions produced are described. The haemoglobin seems to be in some way connected with nitrogen fixation by nodules because it was present in nodules of every leguminous plant examined and because of the inhibition of nitrogen fixation by a very low partial pressure of carbon monoxide, pressure at which carbon monoxide is known to react mainly with haemoglobin. Its functions at present are difficult to determine. The root nodule haemoglobin represents the first case of the occurrence of this pigment in plants. Of great interest is the fact that neither the plant cells alone nor the symbiotic micro-organisms (*Rhizobium*) cultivated separately are capable of synthesizing haemoglobin. It is only when the root cells are invaded by specific symbiotic micro-organisms (*Rhizobium*) and begin to proliferate that haemoglobin is formed.

399. RICHARDS, L. A., AND WEAVER, L. R. 631.67: 631.432
Moisture retention by some irrigated soils as related to soil-moisture tension.
J. agric. Res., 1944, **69**: 215-35, bibl. 21.

The moisture equivalent, the first permanent wilting percentage and the ultimate wilting percentage were determined for 71 southern California soils, mostly from cultivated, irrigated orchards or fields.

400. NOVIKOV, G. N. 581.5: 581.192.4
The water balance in some desert plants. [Russian.]
Sovetsk. Botan., 1941, Nos. 5-6, pp. 86-9.

During an expedition to Kazahstan in 1936, the water balance of the following plants was studied in the very dry northern part of the Karsakgaï district: *Spiraea hypericifolia*, *Kochia prostrata*, *Artemisia sublessingiana*, *Anabasis truncata*, *Atriplex cana*, and *Statice subfruticosa*. The main characteristics of each plant are described, and the soil in which they grow indicated. The rate of transpiration was greatest during the heat of the day, and least during the night; yet the difference was no more than between 1 and 9 per cent. The expenditure of moisture was greatest in *Spiraea hypericifolia* and least in *Anabasis truncata*, though even in the latter it was considerable. Nevertheless all the plants maintained their content of moisture.

401. SINGH, D., AND NIJHAWAN, S. D. 631.432
A critical study of the effect of soil mulch on the conservation of soil moisture.
Ind. J. agric. Sci., 1944, **14**: 124-37, bibl. 28.

Experiments carried out at the Dry Farming Research Station, Rohtak, showed that mulching helped to conserve soil moisture, 30% more moisture being present in mulched than in unmulched plots. Clean cultivation was proved to be necessary in view of the excessive drain on soil moisture by weeds. The results of this detailed investigation are well supported by tabulated data.

402. PEPKOWITZ, L. P., GILBERT, S. G., AND SHIVE, J. W. 581.192.4
The importance of oxygen in the nutrient substrate for plants. Organic acid.
Soil Sci., 1944, **58**: 295-303, bibl. 20, being *J. Ser. Pap. N.J. agric. Exp. Stat.*

Determinations were made of the total organic acid content of oat plants grown at varying oxygen tensions of the nutrient substrates, with and without a supply of nitrogen in the form of nitrate. The yield of total organic acids was invariably higher at low than at high oxygen levels in the substrate. The yield of total organic acids was invariably higher in the plants of the plus nitrate than in those of the corresponding minus nitrate cultures. The higher yields of the former can be ascribed only to the presence of the nitrate ion. [From authors' summary.]

Nutrition.

403. VEALE, P. T. 581.192: 581.13
Nutritional information from plant tissue tests.
Reprinted from *Better Crops with Plant Food Mag.* as *Repr. Amer. Potash Inst.* 0-5-42, pp. 7, bibl. 3.

A series of plant tissue tests on various crops growing in 195 fields on 26 different soil types in Indiana showed that

78% of these soils were producing crops inadequately supplied with N, P or K or some combination of these nutrients. Though some soils were well supplied with N and K, the plants growing on them showed deficiencies.

404. HARRINGTON, J. F. 581.192
Some factors influencing the reliability of plant tissue testing.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 313-7.

It was found [in trials at Ithaca, N.Y.] that although differences in the available nutrient supply could be measured by analysis of the extract of fresh plant tissue the results obtained were applicable to only one soil as the differences due to soil type masked the differences due to availability of a given element in the soil. Therefore, before this method can be used widely some method of evaluating the differences due to soil type must be evolved. There was a drift in concentration of an element as the plant matured. It seemed that the most important cause of this drift was the nutrient balance. When an element was low the concentration of its ion decreased as the plant matured and when another or other elements were low the concentration of the ion increased as the plant matured. This drift might be used as a more reliable guide to fertilizer needs than the absolute amount of an ion present in the tissue at any given testing date. The evidence strongly indicates that the conducting tissue such as the petiole of the spinach and the stem of bean is a more reliable guide than other tissues since the magnitude of differences is greater and the response to a change in available supply is quicker in the conducting tissue. It is clear that it is absolutely essential to sample the same morphological region or tissue when making comparisons, as the differences between tissues is usually greater than the differences between fertilizer treatments. [Author's summary.]

405. BAILEY, L. F., AND MCHARGUE, J. S. 581.192: 546.56
Ashing procedures for the determination of copper in plant material.
Plant Physiol., 1945, **20**: 79-85, bibl. 9.

As the result of this investigation, carried out at the Kentucky Agricultural Experiment Station, the conclusion is reached that wet ashing is a much more reliable method of determining copper in tomato and alfalfa plant materials than is the use of porcelain and silica dishes or of platinum crucibles.

406. (SOIL SCIENCE.) 631.42
Methods in chemical analysis of soils.
Soil Sci., 1945, **59**: 1-109, bibls.

This issue of *Soil Science* is devoted exclusively to papers by selected contributors on the techniques involved in chemical analysis of soils.

407. BRAY, R. H. 631.83
Soil-plant relations. I. The quantitative relation of exchangeable potassium to crop yields and to crop response to potash additions.
Soil Sci., 1944, **58**: 305-24, bibl. 19.

The values obtained at the Illinois Agricultural Experiment Station relate to maize, legume, soybean and wheat crops in the Corn Belt. A modification of the Mitscherlich equation is suggested.

408. ČIRIKOV, F. V., AND MALJUGIN, A. A. 581.11: 631.85
Plants and soil phosphates. [Russian.]
Počvovedenie (Soil Science), 1944, No. 6, pp. 269-84.

The availability of phosphates is the subject of the experiments herein described and discussed. The following plants were grown in pots containing four types of soil: buckwheat, oats, peas, mustard, millet and flax. The soils varied in their capacity for yielding, and the plant species for absorbing, phosphates. Not all the soluble phosphates were absorbed, yet a certain proportion of the less available forms were utilized. Among the plants enumerated, buckwheat and peas showed a marked capacity for taking up the less available phosphates, while millet absorbed hardly any. The addition of KNO_3 often enabled the roots to utilize more of the less soluble phosphates.

409. IVANOV, V. V. 632.111: 631.8
The influence of potassic and phosphatic manures on the resistance of spring crops to cold. [Russian.]
Sovetsk. Botan., 1941, Nos. 5-6, pp. 84-6.

The manures, applied either in the ordinary way or in solution to seedlings, rendered beans (*Phaseolus* sp.), lentils, soya beans, peas, *Camelina sativa*, millet, sorghum, buckwheat, tomatoes, cucumbers, wheat, and watermelon resistant to cold.

410. LOOMIS, W. E. 631.821.2: 581.14
Effect of heavy applications of gypsum on plant growth.
Plant Physiol., 1944, **19**: 706-8.

Heavy application of gypsum to potted crop plants at a rate equivalent to 100,000 lb. per acre had no injurious effect.

411. KAPPEN, H., AND LICHTENBERG, P. 631.845
Über die Verwendbarkeit von Kondensationsprodukten des Zyanamids und des Harnstoffs mit Aldehyden als Düngemittel. **(The utilization of the condensation products of cyanamide and urea with aldehydes as a fertilizer.)**
Bodenk. PflErnähr., 1941, **24**: 304-10, from abstract *Zbl. Bakt.*, IIte Abt., 1943, **106**: 67-8.

Of 6 condensation products of cyanamide and urea with aldehydes tested as a source of nitrogen, which would become gradually available to the plant, only acetaldehyde-urea gave promising results, ammonification and nitrification being rapid and extensive. In pot experiments the increase in yield produced by this chemical equalled that produced by calcium cyanamide. Acetaldehyde-urea showed no bactericidal action.

412. BROWN, B. E. 631.84
Plant culture and other studies with some guanidine compounds.
J. Amer. Soc. Agron., 1944, **36**: 760-7, bibl. 13.

In greenhouse pot culture studies guanidine compounds applied at the rate of 40 and 80 lb. per acre proved a fairly effective source of nitrogen for German millet, oats and wheat. Heavier applications were toxic.

413. REEVE, E., PRINCE, A. L., AND BEAR, F. E. 631.811.9: 546.27
The boron needs of New Jersey soils.
Bull. N. Jersey agric. Exp. Stat. **709**, 1944, pp. 26, bibl. 10.

A record of the results obtained in the examination of New Jersey farm soils for boron deficiency. A water soluble boron content 0·35 p.p.m. of air-dry soil was set as the dividing line between boron-deficient and boron-adequate soils. Of 200 soil samples from an equal number of farms 88 were boron-deficient. Crops on well limed soils were more responsive to borax treatments than those on very acid soils. Raising the pH of acid soils had little effect on their water-soluble boron content. Loam soils fixed much more boron than sandy soils and their crops were less easily injured by borax applications. Leaching of applied borax was found to be considerable under the rainfall conditions of the State. Green manures materially increased soil boron content, whereas straw, manure and cottonseed meal did not. Application of 10 to 40 lb. per acre borax markedly increased yields of carrot, spinach, clover and alfalfa. A list is given of crop plants cultivated in the State which are likely to need extra boron and of those which are very sensitive to an overdose. If 5 lb. of borax per ton were added to all fertilizers sold in the State a fair supply of boron could be maintained in the soil.

414. EATON, F. M. 546.27: 581.192
Deficiency, toxicity, and accumulation of boron in plants.
J. agric. Res., 1944, **69**: 237-77, bibl. 16.
The symptoms, growth reactions and boron accumulation characteristics are reported of 50 plant species, among them many fruits and vegetables, grown in sand cultures at different boron levels. The investigation was conducted at Riverside, Calif., during the period 1930-34. There was considerable overlapping between the injurious and the beneficial effects of boron within a plant which makes it difficult to determine an optimum concentration. Full data are presented on concentrations of boron at which deficiency and toxicity symptoms occur, on concentration for best growth, relative tolerance, lowest concentration for injury, boron content of different parts of the plant, etc. The symptoms of boron injury to the leaves of 10 species are illustrated by colour plates. With a number of species the degree of boron accumulation in different parts was found to be related to the climatic conditions under which the crop was grown. High light intensities and possibly the higher temperatures appeared to hinder the movement of boron from the leaves to other organs. It is suggested that soluble but immobile compounds are formed in the mesophyll. The occurrence of deficiency symptoms is, therefore, determined, not only by the amount of boron available in the soil, but also by climatic factors affecting the distribution of the element in the plant.

415. RICHARDS, F. J. 631.811.9: 546.35
Physiological studies in plant nutrition. XI. The effect on growth of rubidium with low potassium supply, and modification of this effect by other nutrients.
Ann. Bot. Lond., 1944, **8**: 323-56, bibl. 9.
This second part of the investigation, which was carried out at the Imperial College of Science and Technology, London, deals with the effect of rubidium on dry weight distribution, net assimilation rate, tillering, fertility, etc., barley again being the test plant. The potassium-deficient plants were grown at two phosphorus levels in two solutions: (1) high ammonium with low calcium, and (2) high calcium without ammonium. An intermediate solution was also used at the high phosphorus level.

Technique.

416. PORTER, R. H. 631.531
Valor de um moderno laboratório de sementes em face da produção. **(Value of a modern seed testing laboratory in raising production.)**
Ceres, 1943, **5**: 84-93.
The paper was written by the Director of the Seed Testing Laboratory at Iowa State College, U.S.A. It describes the methods in use and shows the value of the work to agriculture.

417. WHITE, D. G., AND CHILDERS, N. F. 581.144.2: 581.12
A method for measuring root respiration.
Plant Physiol., 1944, **19**: 699-703, bibl. 8.
A method for measuring root respiration is described from Ohio Experiment Station for which the following advantages are claimed. (1) The medium allows of root and top development similar to that which occurs under field conditions. (2) The air about the roots can be placed in a closed system so that it is re-utilized by the roots for several days while air samples are being withdrawn, hence respiratory responses of roots under conditions similar to poor soil aeration in the field can be studied. (3) The data can be corrected for the respiration of micro-organisms, or such respiration can be prevented. (4) The equipment is standard and available in most laboratories. (5) The making of the daily air analyses occupies only a few minutes. In brief, air pumped into the nutrient solution forces it into the stone crock in which the plant is growing in quartz gravel, thereby forcing the air around the roots into a trap bottle from which air samples are drawn for analysis. The top of the stone crock is covered with an airtight seal made by impregnating triple layers of cheesecloth with ordinary black grafting wax. The stem of the plant projects through the seal. A soil thermograph is fitted, also through the seal.

418. VANSELOW, A. P., AND LIEBIG, G. F., Jr. 535.33
A graphic calculator for spectrochemical analyses.
Reprinted from *J. opt. Soc. Amer.*, 1944, **34**: 219-21, bibl. 8.
The graphic calculator described is a new design incorporating the better features of several calculators described in the literature, with the authors' own ideas. The advantages claimed are that no cross section or logarithm paper is required other than that used in preparing the customary working curves; the percentage transmission scale engraved adjacent to the vertical hair line on the transparent slider is easily read and eliminates the necessity of scanning all the way across the paper for the scale numbers. The practice of writing the scale numbers on the calibration curve each time a new curve is drawn is rendered unnecessary by the engraving of the transmission or blackening scale on the transparent slider.

419. LIEBIG, G. F., Jr., VANSELOW, A. P., AND CHAPMAN, H. D. 581.082.2
The suitability of water purified by synthetic ion-exchange resins for the growing of plants in controlled nutrient cultures.
Reprinted from *Soil Sci.*, 1943, **55**: 371-6, bibl. 1, as *Pap. Calif. Citrus Exp. Stat.* **479.**
It is shown that large quantities of tap water for use in plant nutritional studies can be rendered free from heavy-metal contamination by means of passage through synthetic ion-exchange resins. The cost after installation of the plant is 0·1 cent. per gallon with equipment having a capacity of 300 gallons an hour.

420. WILFORD, B. H. 674.048.4
Chemical impregnation of trees and poles for wood preservation.
Circ. U.S. Dep. Agric. **717**, 1944, pp. 30, bibl. 26.
Based on large-scale experiments in North and South Carolina over a 10-year period the circular furnishes information on the best methods of wood preservation by means of chemical impregnation. The stepping and capping treatments practicable with trees of 6 and 8 in. diameter respectively and the more complicated collar and banding methods are illustrated by photos. Out of the number of (poisonous) chemicals recommended for impregnation the following may be mentioned, the dosage applying to 1 cubic foot of wood: (1) ¾ lb. copper sulphate + ½ gal. water; (2) 1 lb. zinc chloride + ½ gal. water; (3) ¾ lb. chromated zinc chloride + ½ gal. water. Others, such as ammonium bifluoride, a mixture of copper chloride and arsenic acid and zinc meta-arsenite are reported as promising. Absorption of the solution by pines and yellow poplars takes 2-6 hours, but 2 weeks are required for optimum distribution. Sap stream methods have proved more satisfactory with pines than with hardwood trees. Hardwoods are best treated in late spring and summer, while pine trees can be treated at all temperatures above freezing.

Growth substances.

421. AMLONG, H. U. 577.15.04: 581.14
Hormone treatment of plants. [German.]
Landw. Jb., 1943, **93**: 141-68, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 184-5.
Several methods were used at the Plant Physiological Institute, Poznan, for treating plants with hormones. (1) Before being pricked out or transplanted the seedling roots were immersed in a solution of growth hormone. This treatment did not prove suitable for certain plants, such

as celeriac and lettuce, since the plants suffered somewhat from the soil particles being washed from the roots. With sunflower seedlings side root formation was stimulated by a solution of the potash salt of β-indolylbutyric acid + ascorbic acid, applied for 3 hours. The addition of monopotassic phosphate to the solution further increased the success in a field experiment. An addition of trace elements had a favourable effect on savoy and late cabbage, while lettuce and red cabbage failed to respond. (2) The soaking of cauliflower and savoy seed in a solution of the potash salt of α-naphthylacetic acid + ascorbic acid + thiourea resulted in an increase in yield, provided nitrogen was applied at the normal rate. (3) Dry treatment of seeds with α-naphthylacetic acid mixed with a disinfectant dust failed to increase yields. (4) Growth substances were added to pressed loam-soil pots, into which tomato, cauliflower and kale plants were pricked out. Later, the plants were transplanted in the field with their pots. A considerably higher yield is reported for the plants treated with growth substances than for the controls grown in pots with no addition or with the addition of trace elements. Deviations from the optimum dosage proved harmless. Certain growth substances were found to delay germination and to reduce the rate of growth. This effect could be counteracted by the addition of ascorbic acid, thiourea and certain other substances.

422. Hamner, L., Schomer, H. A., and Marth, P. C. 577.15.04: 632.95: 635.64
Application of growth-regulating substance in aerosol form, with special reference to fruit-set in tomato.
Bot. Gaz., 1944, **106**: 108-23, bibl. 8.

The aerosol method of applying growth substances recently developed at Beltsville, Maryland, allows of treating a plant or tree in a few seconds merely by opening a valve. A mixture of liquefied gas (methyl ether), growth substance and carrier solvent (cyclohexanone) is held under pressure in a container which is equipped to release the mixture in a very fine mist. The small amounts of cyclohexanone applied were shown to have no harmful effect on tomato plants receiving growth substance treatment for fruit-set. Of the substances tested 4-chlorophenoxyacetic acid was the most effective in inducing fruit set of seedless fruits and of stimulating early fruit growth. It gave excellent results, even at very low concentrations, but there was a tendency for the locules of the fruit to be poorly filled. Concentrations higher than 0·01% proved harmful. Good results were obtained also with β-naphthoxyacetic acid, but the concentration required was higher (0·01-0·5%).

423. Zimmerman, P. W., and Hitchcock, A. E. 577.15.04: 632.95: 635.64
The aerosol method of treating plants with growth substances.
Contr. Boyce Thompson Inst., 1944, **13**: 313-22, bibl. 8.

The aerosol method of using steel cylinders ("bombs") for atomizing growth substances dissolved in acetone, sesame oil and a liquefied gas (Freon) is described. Three models of cylinders were used for local applications, for dispensing growth substances in the greenhouse and for treatment in the field. The method proved very effective for inducing parthenocarpy and fruit set in tomatoes both in the greenhouse and in the field, but some of the chemicals also showed a modifying influence on leaves, which is undesirable. A list of 31 growth substances is presented indicating the effective range of concentrations and their activity or inactivity for modification of leaves. Out of doors, the spray was aimed at the clusters, the first clusters of young plants responding with fruit set to the treatment. The inclusion of fungicides in the aerosol applications is anticipated. The hot plate method of mist production in a greenhouse by means of spraying a solution of growth substance, carbon tetrachloride and sesame oil from an atomizer upon a hot plate is also mentioned.

424. Hitchcock, A. E., and Zimmerman, P. W. 577.15.04: 631.535
Comparative root-inducing activity of phenoxy acids.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 187-9, bibl. 3.

A summary is given of results obtained with 63 phenoxy compounds on privet cuttings. Only 4 of them were of high and approximate equivalent activity to naphthaleneacetic acid as regards inducement of normal roots. A more detailed account is promised as a contribution from the Boyce Thompson Institute.

425. Lee, S. W., Foley, E. J., and Epstein, J. A. 633.88: 577.15.04
Plant-growth substances and *Penicillium notatum*.
Nature, 1945, **155**: 333-4.

The effects of growth substances at different concentrations on the production of penicillin by *P. notatum* were observed. Indoleacetic acid was most effective at a concentration of 1 in 10,000, whereas naphthaleneacetic acid was more active at 1 in 100,000. Work on other concentrations is being continued.

426. Beal, J. M. 577.15.04
Further observations on the telemorphic effects of certain growth-regulating substances.
Bot. Gaz., 1944, **106**: 165-78, bibl. 5, being *Contr. Hull bot. Lab.* **564.**

The efficacy of Carbowax 1500 as a carrier of growth substances was compared with that of lanolin, sweet pea, African marigold and red kidney bean serving as test plants. With the exception of 4-chlorophenoxyacetic acid, where lanolin proved more effective, greater growth responses and form changes were, on the whole, obtained with Carbowax as carrier.

427. Loo, T.-L. 631.811.9 + 577.15.04 + 547.944.6
A comparison of the effect on plant growth of micro-elements and of indole acetic acid and colchicine.
Ann. Bot. Lond., 1944, **8**: 357-62, bibl. 9.

The results of investigations, obtained by the author and other workers at the National University of Chekiang, China, are summarized under the following headings: The effect of manganese sulphate, indole-3-acetic acid, and colchicine on germination and early growth; the effect of micro-elements other than manganese; the effect of manganese sulphate, indole-3-acetic acid, and colchicine on pollen germination and pollen-tube growth; histological responses of the stem of sunflower to manganese sulphate, indole-3-acetic acid and colchicine; effect of micro-elements, indole-3-acetic acid, colchicine, and some anaesthetics on the elongation of wheat coleoptiles; relation of manganese, indole-3-acetic, and colchicine to other growth phenomena; the effect of micro-elements, indole-3-acetic acid, and colchicine on the metabolic activities of plants. It is suggested that the growth-promoting effect of manganese and other micro-elements is due to their action as catalysts. Indole-3-acetic acid proved ineffective, but colchicine was found to promote growth at low concentrations. In the author's view the term "growth-promoting" should not be used for a substance "which does not bring about a higher percentage of germination, more, longer, and thicker stems and branches, larger leaves, more vigorous roots and, in general, a greater dry weight". The future research programme is outlined.

428. Yeager, A. F., and Haubrich, W. P. 547.944.6
A comparison of the effect of colchicine applications on plants and seeds.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 251-4, bibl. 3.

A description is given of the colchicine treatment of plants by the immersion method, solutions in agar, injection method, in lanolin paste and by the single drop method.

The seed was treated by soaking in colchicine for varying periods. Methods and results with a number of plants are discussed.

General.

429. ROZEIRA, A. 581.9(469)
A flora da província de Trás-os-montes e Alto-Douro. (The flora of the Province of Portugal Tras-os-Montes and Alto Douro.) [French summary 2 pp.]
Mem. Soc. broteria., 1944, 3: 1-203, bibl. 202.
The flora of the province can be divided into two groups, one allied to that of Central Spain, the other to that known as Beira. An appendix gives names and localities of all the species known. There is no index and the families are arranged in a different order to that customarily used, which makes reference difficult.

430. KOTOV, M. I. 633.88(47)
The work of the Systematics and Geo-botanical Department of the Botanical Institute of the Academy of Sciences of the U.S.S.R. between the 1st October 1941 and the 31st December 1943. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 56-7.
A short note on certain publications dealing with the medicinal plants of the Baškir A.S.S.R. and other subjects of horticultural interest.

431. BOTANICAL SOCIETY OF AMERICA. 633/635
Abstracts of the papers presented before the General, Paleobotanical, Physiological and Systematic Sections of the Botanical Society of America, Cleveland, Ohio, 12-14 September 1944.
Amer. J. Bot., 1944, Vol. **31**, No. 8, pp. 1s-14s.
Abstracts are given of 64 and notes of 6 papers. Among others the following contain points of interest to horticultural research workers.

(1) General Section.

BLAKESLEE, A. F.
Micrografting, a method of securing seedlings from excised embryos which fail to develop roots.

CASTETTER, E. F.
New evidence on the antiquity of tobacco cultivation in the Southwest.

FRAZIER, J. C.
Field bindweed, hoary cress, Russian knapweed, and dogbane, the most noxious group of weeds in Kansas, their nature and rate of development.

GIER, L. J.
Shoot-root ratio and moisture relations [in tomatoes].

LA RUE, C. D.
Grafts of monocotyledons secured by the use of intercalary meristems.

PRICE, W. C.
Thermal inactivation of southern bean mosaic virus.

SINNOTT, E. W.
The relation between growth rate and fruit size in cucurbits.

TURRELL, F. M.
Radiation and sulfur injury to lemon fruit.

VESTAL, P. A.
Uncultivated food plants used by the Ramah Navaho [Indians].

WARMKE, H. E.
The effect of tetraploidy on root weight and rubber content in the Russian dandelion.

(2) Physiological Section.

AVERY, G. S.
Rapid extraction of free auxin and auxin precursor from green plant tissues.

BONNER, J.
An inhibitor of plant growth obtained from cultures of guayule plants.

COMMONER, B., AND MAZIA, D.
The mechanism of auxin action: the effect of auxin and the C_4 acids on salt and water absorption in *Avena* coleoptile and potato tuber tissue.

COX, L. G., MUNGER, H. M., AND SMITH, E. A.
A germination inhibitor in the seed coats of certain varieties of cabbage.

GALSTON, A. W., AND BONNER, J.
The isolation in pure form of two plant growth inhibitors from guayule plants.

GUSTAFSON, F. G.
Growth inhibitors in plant extracts.

HOPKINS, E. F.
Antagonistic action of iron and manganese in soil and solution cultures [of pineapple].

LANGHAM, D. G.
Sesame breeding in Venezuela.

STRUCKMEYER, B. E.
Further observations on the microincineration and mineral analysis of plant tissue.

TSCHUDY, R. H.
The ascorbic acid content of Douglas fir needles.

ZIMMERMAN, P. W., AND HITCHCOCK, A. E.
New growth substances, their comparative activity, and methods of applying them.

(3) Systematic Section.

BLAYDES, G. W.
Chimeras of *Lycopersicon* and *Sanseveria*.

ROLLINS, R. C.
Analogous plant types from natural populations of guayule (*Parthenium argentatum*) and mariola (*P. incanum*), and certain derivatives of crosses between these species.

Noted.

432. EMMERT, E. M. 581.192
(13) **Modification of the phenoldisulfonic acid method for potassium to increase rapidity and accuracy.**
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 311-2, bibl. 2.

HARDER, R., AND BODE, O. 612.014.44
Über die Wirkung von Zwischenbelichtungen während der Dunkelperiode auf das Blühen, die Verlaubung und die Blattsukulenz bei der Kurztagspflanze *Kalanchoë blossfeldiana*. **(The effect of illumination during darkness on flowering, foliation and leaf succulence in the short-day plant *Kalanchoë blossfeldiana*).**
Planta, 1943, **33**: 469-504, from abstract *Gartenbauwiss.*, 1944, Vol. **18**, abstr. p. 51.

HERRIOT, R. I. 631.459(942)
Soil erosion. The problem in S. Australia, and what is being done about it.
J. Dep. Agric. S. Aust., 1944, **48**: 112-20.

JUDKINS, W. P., AND TOLK, J. G. 77: 634/635
The use in horticultural publications of black and white prints from Kodachrome transparencies.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 338-40, bibl. 2.

KALIN, E. W. 663.61: 631.589: 631.85
Phosphorus availability and the mineral aggregate used in nutrient solution culture.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 305-10, bibl. 8.

LEWIS, H., AND WENT, F. W. 581.81: 612.014.44: 581.036
Plant growth under controlled conditions. IV. Response of California annuals to photoperiod and temperature.
Amer. J. Bot., 1945, **32**: 1-12, bibl. 13.

LI, J. C. R. 63: 519
Design and statistical analysis of some confounded factorial experiments.
Res. Bull. Ia agric. Exp. Stat. **333**, 1944, pp. 449-92, bibl. 9.

MAHALANOBIS, P. C. 519: 633/635
On large-scale sample surveys.
Philos. Trans. roy. Soc. Lond., 1944, Ser. B, No. 584, **231**: 329-451, bibl. 24.

VON NOSTITZ, A. 631.588.1
Über den Einfluss des elektrischen Stromes auf Pflanze und Boden. (**The effect of electric current on plant and soil.**)
Bodenk. PflErnähr, 1943, **32**: 146-54, from *Gartenbauwiss.*, 1944, Vol. **18**, abstr. pp. 51-2.

PADDICK, M. E. 663.61: 631.589
A simple apparatus for sand culture work.
Plant Physiol., 1944, **19**: 704-5.

RAGGIO, J. L., DRAGONETTI, J. C., AND FOGLIA, A. E. 631.67
Medición de las aguas en las estaciones experimentales de riego. (**Measurement of irrigation water in experiment stations. The use of spring gauges for the measurement of small volumes.**) [½ p. Spanish, English and Portuguese summaries.]
Rev. Fac. Agron. B. Aires, 1943, **10**: 422-50.

SCHAEDE, R. 581.523.4
Die pflanzlichen Symbiosen. (**Plant symbioses.**) G. Fischer, Jena, 1943, pp. viii+172, 10 RM, from review *Zbl. Bakt.*, IIte Abt., 1943, **106**: 51.

SCHRANK, A. R. 577.15.04
Changes in electrical polarity in the *Avena coleoptile* as an antecedent to hormone action in geotropic response.
Plant Physiol., 1945, **20**: 133-6, bibl. 11.

TREE FRUITS, DECIDUOUS.

Economics.

433. NEW ZEALAND DEPARTMENT OF AGRICULTURE. 633/635(931)
Primary production in New Zealand. (Revised Edition.)
Publ. (out of series) *N.Z. Dep. Agric.*, 1945, pp. 96.
In this revised and enlarged publication, which presents an up-to-date survey of agriculture in New Zealand, chapters are devoted to linen flax, the production of crop seeds (peas), and orchards and gardens. Acreage and production figures are given for apples, pears, stone fruit, citrus and various small fruits.

434. STRICKLAND, A. G. 634/635(942)
The future of horticulture.
J. Dep. Agric. S. Aust., 1944, **48**: 100-7.
A review of the position of South Australian horticulture. Reference is made to the post-war possibilities of various forms of production and to the need of early planning for future expansion.

435. BROADFOOT, H., AND WHITTAKER, E. C. 634.11(944)
The apple industry in New South Wales. A review of production problems, present and post war.
Agric. Gaz. N.S.W., 1944, **55**: 277-82, 337-41, 377-81, 485-8, 527-30.
In this review of apple production problems in New South Wales chief emphasis is laid on the selection of suitable areas for future plantings as a remedy for the low average performance per tree for the State as a whole. Only the districts of Orange, Batlow and Armidale can, in the authors' view, claim to combine the three essentials of a first-class producing area, namely a climate mild in summer and cool to cold in winter, an average rainfall of not less than 28 in., a fair proportion of which should be spread over summer and early autumn, and a reasonably fertile, well-drained, deep soil. Large marginal and sub-marginal areas planted to apple, which do not comply with these conditions, are bound to remain disappointing. However, thousands of acres of excellent virgin apple land with good access to the Brisbane and Sydney markets are still available for expansion of the industry around Batlow and Armidale and, to a lesser degree, in the Orange district. The influence of the following factors on apple production is discussed in detail: soil moisture, nutrient deficiencies, pruning, spur-bearing, soil erosion, rootstocks, varieties, hail damage, frost, thrips, alternate cropping, pollination, age and vigour of trees, the economic life of an orchard.

436. REINECKE, M. R. V. 634.11(68.01)
Apple production in the Langkloof Valley.
Fmg S. Afr., 1945, **20**: 21-4, 56.
Climate and rainfall, geological formations, transport facilities and types of farming in the about 100-miles-long Langkloof Valley between the Outeniqua-Tsitsikama mountains are described. The apple production of the Valley in 1941-42 amounted to 9,900 tons, but it is expected that with the adoption of improved cultural methods and more trees coming into bearing this figure will be trebled by 1945-46. The number of pear, plum and peach trees is also considerable. It is anticipated that in view of its resources awaiting development Langkloof may become the most important fruit growing area of the Union and one of the leading fruit growing areas of the world within the next 50 years or less.

437. ENGSTEDT, G. 634.1/7(485)
Drottninghögs fruktodlingar, Hälsingborg. (**Fruitgrowing in Hälsingborg.**)
Sverig. pomol. Fören. Årsskr., 1944, **45**: 213-28.
An interview with a prominent fruit grower in Southern Sweden who devoted more than half of his 6,000-tree orchard to Cox's Orange. Such cultural practices as cultivation, manuring, pruning, spraying, irrigation, harvesting and storing as well as commercial problems such as marketing and profits are discussed.

438. (KENT WAR AGRICULTURAL COMMITTEE) 634.1/7(410)
Fruit planting—where, what and how to plant.
Fruitgrower, 1944, **98**: 429-31, 445-6, 465-6.
A summary of papers, read chiefly by growers and agricultural officers, at a conference organized by the Kent War Agricultural Committee Technical Development Sub-Committee at Maidstone on 30 November. A wide range of subjects was covered. [For abstracts of papers see 439, 491.]

439. TAYLOR, H. V. 634.1/7(410)
The fruit the country needs. 1944 census disclosure.
Fruitgrower, 1944, **98**: 423-4, 428.
A paper read at a Fruit Conference held by the Kent War Agricultural Committee at Maidstone in November 1944. Present acreage under fruit in Great Britain (1944) is 282,000 acres, as against 275,000 acres in 1925. The area under bush and berry fruits has decreased by about 50% since 1925 whereas the area to top fruit has increased by 25,000 acres including 3 million apple trees. Before the present war there was always a surplus of cooking apples and a shortage of good dessert kinds, which had to be made up by imports representing an area of 50 to 70 thousand acres. The public is learning to discriminate in dessert fruit. At present there are 15,200,000 trees of dessert and cooking apples in Great Britain, of which 5,000,000 are under 9 years old. Analysis of this 5 million shows that over 3 million are Cox's, 1¼ million various dessert kinds and ¾ million cookers. Many of the dessert trees are Cox's grown as cordons or small trees, whereas the cookers are large spreading trees, and to get a true comparison the Cox's cropping figures should be divided by 25 to 30. The planting of Worcesters has recently decreased. Growers would do better to refrain from marketing green unripe fruit. In soft fruit the decline in acreage in strawberries, raspberries and black currants is attributed largely to poor stocks giving unremunerative returns and the home supply of soft fruits is well below the country's needs. This is not in the national interest; an increased acreage of dessert fruits of all kinds and soft fruits for the jam factories is desirable in view of the probable difficulty of importing in the immediate post-war years.

Varieties and breeding.

440. BROOKS, R. M., AND OLMO, H. P. 634.1/8-1.524
Register of new fruit and nut varieties. List No. 1.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 467-90.
The aim of these workers at the University of California, Davis, is to make as complete a record as possible of each new fruit and nut originating in N. America since 1920 inclusive and to continue the records and to make them freely available as in the present article. They record the data presented by the contributor, i.e. by the originators themselves or those instrumental in introducing the new variety. The data asked for include:—name and synonyms; originator and firm or institute introducing to commerce; patent No. if granted, and date of introduction to commerce; place and date of origin, parentage or bud mutation; resemblance to other fruits; most valuable characteristics. The list presented here contains data received since the inception of the register in 1942 and deals with some 230 varieties of 30 species, apple, avocado, peach and strawberry providing the largest numbers. It includes an alphabetical index.

441. SIMMONDS, A. 634.11
The origin of apple "Bramley's Seedling".
J. roy. hort. Soc., 1945, **70**: 99-103.
A full account of the origin of the favourite English cooking apple, Bramley's Seedling. Briefly, it was raised from a pip or whole fruit planted between the years 1809 and 1813, in a garden which later became the property of a Mr. Matthew Bramley, in Church Street, Southwell, Notts. The first grafts for commercial distribution were taken by Messrs. Merryweather in 1856.

442. GARDNER, V. R. 634.11: 575.255
A study of the Sweet-and-Sour apple chimera and its clonal significance.
J. agric. Res., 1944, **68**: 383-94, bibl. 20, being *J. Art. Mich. Agric. Exp. Stat.* **661** (n.s.).
The general characteristics of the Sweet-and-Sour apple are described as they are reported in the literature of the past 150 years and as they appeared on trees of this type in an experimental orchard. Clear differentiation between sweet and sour tissue in the same fruit was made possible by treating an exposed section to a 0·4% aqueous bromcresol-green solution. All of the trees proved to be chimeras, producing partly sweet and partly sour fruits. Some of the trees produced fruits in which the sweet tissue predominated over the sour; other trees produced fruits in which the sour tissue predominated over the sweet. These tree differences remained constant from year to year. Cross sections of the same fruits at different levels and also tangential and radial sections of the same fruit show extreme diversity in the sweet and sour tissue pattern or distribution. If the Sweet-and-Sour apple is classified as a meriClinal or mosaic type of chimera, this concept implies that the pome fruit is essentially "appendicular" in its morphology. [Author's summary.]

443. SWANSON, C. P., AND GARDNER, V. R.
634.11: 575.252
A pomological and cytological study of a russeted sport of the Stark apple.
J. agric. Res., 1944, **68**: 307-15, bibl. 9, *J. Art. Mich. agric. Exp. Stat.* **648** (n.s.).
A single variable bud sport of the Stark apple showing generally a thin and even russeting was investigated in order to throw some light on the origin of bud sports in pome fruit. A cytological study revealed the following diploid chromosome numbers: Normal Stark, 42; bud sport, 51; a branch showing a partial reversion, 46; a branch showing a complete reversion, 42. Apart from reversions there was a tendency to "mutate" toward more extreme forms of russeting.

444. COWIN, R. E. 634.21
My experience with new apricot varieties for fresh fruit shipment.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, pp. 117-8.
Apricots Riland, Perfection and Phelps are new varieties in the U.S.A. which seem to promise well for fresh fruit shipment. Their habits and peculiarities are described.

445. MAGNUSSON, K. 634.23(485)
Körsbärsodling. **(Cherry growing in Sweden.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 84-93.
The author gives an account of his life-long experience in cherry growing (sweet and acid) in Sweden, including his observations on the effect of the severe winters 1939-42. Twenty-five varieties are discussed.

446. HÜLPHERS, A. 634.11 +664.85.11
Tre hållbara äpplesorter. **(Three apple varieties with good keeping qualities.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 94-7.
It is suggested that in certain parts of Sweden, in view of their good keeping qualities, the following little-known apple varieties would be a welcome addition to the number of those grown: Kaiser Wilhelm, Geheimrath Breuhahn and King's Acre Pippin. The three varieties are described and illustrated.

447. NILSSON, F. 634.1/7-1.523
Balsgårds fruktträdsförädlingsanstalt. **(The Balsgård Fruit Breeding Station.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 58-9.
The article is an extract from a paper read at the meeting of the Swedish Pomological Association in 1944. An account is given of the breeding work with diploid and tetraploid apple varieties in progress at the Balsgård Station recently established by the Association.

448. NILSSON, F., AND LARSSON, G. 634.11-1.523
Nya tetraploider av äpple vid Balsgård. **(New tetraploid apples at Balsgård.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 123-9, bibl. 11.
A report on the work carried out at the Balsgård Fruit

Breeding Station with tetraploid offspring (32 plants) of the following triploid apple varieties: Belle de Boskoop (9), Järnäpple (3), Canada Reinette (8), Ribston (12).

449. NILSSON-EHLE, H. 634.11-1.523
Några nya rön rörande tetraploida äpplesorter och deras användning och roll vid växtförädlingen hos fruktträd. **(New experiments with tetraploid apple varieties and their significance in breeding.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 229-37, bibl. 4.

A further progress report on the author's breeding work with tetraploid apples (*ibidem*, 1942, 43: 25-8; *H.A.*, 13: 718) which are being raised at Ramlösa. The seedlings No. 37/48, 37/54 and 37/60 (produced 1937) flowered copiously in 1944, and No. 38/1 (produced 1938) showed its first flowers. From the pollination of 2,572 diploid flowers with tetraploid pollen 573 fruits were obtained, while the reciprocal cross produced 9 fruits as a result of 101 pollinations. Cox's Orange figures prominently among the diploid varieties, with the help of which it is hoped to raise a triploid apple combining first rate dessert quality with a long storage life. The variety Old Nonpareil is mentioned as another particularly promising diploid parent, which gives good fruit set both ways. Because of the small size of its fruits the variety is of little economic importance, but it may be hoped that this drawback will be overcome in the hybrid owing to the tendency of polyploids to increase in size. A table indicates the results obtained from crosses with 17 other diploid varieties. Some crosses were carried out also between triploid and tetraploid and among tetraploid varieties. Comparisons show that the seeds and fruits from tetraploid trees are much larger than those of diploid varieties. Volume and weight of a tetraploid No. 37/60 fruit, for instance, was 74% and 83% respectively larger than that of an average Boskoop apple. The further breeding programme is outlined.

450. JOHANSSON, E. 634.11-1.523
Fortsatta undersökningar beträffande en 68-kromosomig äpplesort. **(Further investigations on an apple variety with 68 chromosomes.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 135-40, bibl. 4.

The fruits are described of the tetraploid seedling obtained at Alnarp from a cross Belle de Boskoop × Filippa (see *ibidem*, 1943, 44: 55-60; *H.A.*, 14: 486), now designated T16/36. The seedling is self-fertile and shows a fruit set of 10%. A number of crosses between T16/36 and certain diploid and triploid varieties were carried out and data are presented on the resulting fruits giving details of fruit set, average fruit weight, number of seeds, seed weight and measurements of seeds.

451. BLAKE, M. A. 634.25-1.523
Some methods used in breeding peaches in New Jersey.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 220-4, bibl. 2.

A description is given of the actual procedure adopted in breeding peaches under New Jersey conditions.

452. SCOTT, D. H., AND WEINBERGER, J. H. 634.25-1.523
Inheritance of pollen sterility in some peach varieties.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 229-32, bibl. 1.

A discussion of the pollen fertility observed in peach varieties at Beltsville, Md and Fort Valley, Ga.

453. WEINBERGER, J. H. 634.25-1.523
Characteristics of the progeny of certain peach varieties.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 233-8.

The following particulars are given of a number of new peach crosses from Fort Valley, Ga:—time of blossoming, bud set, time of ripening, size, form, pubescence, colour, and firmness of fruit and edible quality.

454. YARNELL, S. H. 634.25-1.523
Temperature as a factor in breeding peaches for a mild climate.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 239-42.

Selections for breeding peaches under Texas conditions have come from trees which combine adaptability to mild winters, medium to late blooming habit and hardiness of flower buds to cold. A number of varieties are here graded for these characters.

455. LESLEY, J. W. 634.25-1.523
Peach breeding in relation to winter chilling requirement.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 243-50, bibl. 4.

In the Californian breeding work described here, the aim of which is the production of peaches suitable for growing under subtropical conditions, crossing has generally given rise to a variety of phenotypes differing in chilling requirement. Results of crossing differed greatly. About three-fifths of the F_1 families did not appreciably differ from the chilling requirements of their parents, one-fifth had less and one-fifth had more chilling requirements than their parents. From selfing—which has generally not resulted in loss of vigour—24% appear to need less, and 40% more, chilling than their parents.

456. BLAKE, M. A., AND STEELMAN, C. H., Jr. 634.25-2.111
Preliminary investigations of the cold resistance of peach fruit buds at the pink bud stages of development.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 37-41.

These trials in New Jersey with 16 varieties of peach, submitted at different stages of bud development to different degrees of cold, show great differences in resistance between varieties and different stages of the same variety.

457. TUKEY, H. B. 634.25-1.521.5
The excised-embryo method of testing the germinability of fruit seed with particular reference to peach seed.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 211-9, bibl. 10.

A choice of germination methods is offered including Petri dishes, china plates, plaster blocks and wet cloth. Satisfactory accuracy is obtained by all methods.

458. LESLEY, J. W. 634.25-1.523
Peach varieties for use in the citrus belt.
Calif. Citrogr., 1945, **30**: 68-9.

In California many peach varieties, including all the standard varieties, give poor results owing to insufficient winter chilling. By crossing short-chilling varieties (these are generally insipid and short keeping) with the standard varieties requiring long chilling a series of new varieties suitable for the citrus belt has been developed. It is doubtful whether they will be of sufficient firmness for shipping unless special precautions are taken. A partial list of these varieties is given, with a note on flavour and time of ripening at Riverside. No nectarine can be recommended for the citrus belt.

Propagation.

459. SYLVAN, H. 631.537: 634.1/2(485)
Lantbruksstyrelsens till Kungl. Maj:t avgivna förslag angående plantskolekontroll. **(A recommendation of the Ministry of Agriculture on State supervision of nurseries in Sweden.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 152-73.

The memorandum contains recommendations on the extent

and the methods of State supervision of nurseries in Sweden. In an appendix suggested regulations are drafted for the registration of nurseries, the use of official trade marks and the setting up of a Swedish nursery board.

460. INGRAM, C. 634.11(83)-1.532
Propagation of apple trees in Chile.
Gdnrs' Chron., 1945, **117**: 92-3.
Attention is called to a passage dated 4 February, 1835, in Darwin's *Voyage of the Beagle* in which it is stated that in the damp climate of Valdivia, Chile, the apple grows so luxuriantly that it may be rooted from stumps of branches laid 2 feet deep in the ground (presumably as olives are sometimes propagated). The branches selected are those which are already producing clumps of root initials on their undersides when on the tree, that is to say that in Valdivia almost every branch is suitable. A heavily fruiting tree is said to be produced in 3 years. Mr. Collingwood Ingram in reprinting this note adds that quite large branches of *Camellia japonica* can be rooted in this way in the Azores in a rich lava soil and high humidity. [Many English apple and other fruit trees display these aerial rootknots. The subject is discussed by R. G. Hatton and others: On burr-knots of fruit trees. *J. Pomol.*, 1926, 5: 195-204.—ED.]

461. PRAVDIN, L. F. 631.535.7
The influence of size and age of cuttings on their root forming capacity. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 28-37.
Leaf cuttings are the object of special attention in the present article, particularly cuttings of *Salix caprea*, *Populus laurifolia*, *Morus alba* and *Syringa vulgaris*. Four types of cutting were taken from each species. The first consisted of a leaf together with the axillary bud and a small piece of the stem to which the bud was attached; the second of a leaf alone, including the petiole, but without the bud; the third of one internode of the stem with leaves attached, and the fourth of two internodes with leaves. The second type of cutting proved the best; larger cuttings, such as those of the third and fourth types, did not root so well. Cuttings of *Syringa* rooted more vigorously than those of the other species; and in all the species cuttings taken from the middle third of a shoot rooted best, while those near the base or at the tip formed no roots unless treated with heteroauxin.

462. JOHN INNES HORTICULTURAL INSTITUTION. 631.53
Soil ingredients of the John Innes composts.
John Innes Leafl. **6** (2nd edition), 1945, pp. 9, 6d.
For an abstract of the first edition see *H.A.*, 15: 18. The swiftly following second edition has been enlarged by two photographs and a paragraph on the choice of loam based on a growing test with tomato seed.

463. WAKSMAN, S. A. 631.878
Peat and its uses.
Bull. N. Jersey agric. Exp. Stat. **681**, 1940, pp. 11.
ANON.
Specifications for peat materials.
Circ. N. Jersey agric. Exp. Stat. **407**, 1941, pp. 4.
The bulletin deals with New Jersey peat in general, touching on its possible agricultural uses. The circular considers the evaluation of peat for soil improvement purposes, distinguishing also between so-called moss peat, sedge and reed peat, forest peat and peat soil.

464. STOUTEMYER, V. T., CLOSE, A. W., AND HOPE, C. 583.4: 631.531
Sphagnum moss for seed germination.
Leafl. U.S. Dep. Agric. **243**, 1944, pp. 6.
A detailed description is given of a method of using sphagnum moss for seed germination, which has been worked out at the U.S. Introduction Garden at Glenn Dale, Md, and of which the principal points are: Fill shredded, moistened sphagnum moss into flats or place it as a 1-in.-thick layer over a well-drained foundation of sand or peat etc., and sow broadcast in rows. Sprinkle the surface with an atomizer, cover the seed with a pane of glass and water generously; the moss will tolerate overwatering. More vigorous growth of the seedlings may be obtained by applications of a nutrient solution, for instance 2 teaspoonfuls of a 12-12-6 fertilizer mixture per gallon. By withholding the nutrients the development may be arrested at any stage for some considerable time. Other advantages of the use of sphagnum are that the seedlings are not susceptible to attack by damping-off fungi and that removal from this substratum causes less disturbance to the roots than transplanting from soil. The method should therefore be particularly suitable for plants going to distant destinations.

465. KRÜSSMANN, G. 631.53
Die Praxis der Gehölzvermehrung. **(The propagation of woody plants.)**
P. Parey, Berlin, 1943, pp. 275, 2nd ed. RM. 5, from review *Gartenbauwiss.*, 1944, Vol. **18**, abstr. pp. 53-4.
This practical manual for nurserymen, foresters and students is based on the experiences of the well-known German firm of L. Späth.

Rootstocks.

466. ÖSTLIND, N. 631.541.11: 634.11 + 634.13
Om grundstammar för äpple och päron. **(Apple and pear rootstocks.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 5-15.
In a paper read before the 1944 spring meeting of the Swedish Pomological Association the problem of apple and pear rootstocks was reviewed. The conclusion was reached that frost resistance is one of the most important characters under Swedish conditions and that clonal rootstocks are more suitable than seedlings. It is therefore of the greatest importance that new cold resistant rootstocks which propagate easily should be produced and it is expected that the large-scale trials conducted by the Government will soon yield their first results.

467. BEAKBANE, A. B. 634.11-1.541.11-1.542
The intensive culture of hardy fruit trees. I. Trials of Cox's Orange Pippin and Worcester Pearmain apple cordons.
J. Pomol., 1945, **21**: 41-52, bibl. 5.
Records up to 10 years of cordon Cox's Orange Pippin and Worcester Pearmain at East Malling Research Station are discussed. Trees were planted in 1935, '38 and '41. The three chief trials concerned were:—(1) (i) rootstock, (ii) planting distance in the rows and (iii) pruning; (2) four leader-tipping treatments on M. I, and (3) planting angles. (1) (i) The order of vigour as judged by cross section of stem was, in ascending order: M. IX, VII, I and II (equal), IV, XII. Degree of stem size was reflected in weight of prunings and tree length in IX and XII. The other stocks were intermediate and did not differ from each other. Trees on IX throughout had the most fruit buds in relation to tree size. In later years trees on the other stocks equalled them in fruit buds but not in crop. (ii) Trees spaced 3 ft. 6 in. in the rows bore more fruit buds and a heavier crop per tree than those spaced 1 ft. 9 in. but the closer spacing gave the highest crop per acre. (iii) Trees pruned entirely in summer in mid-July and mid-September were smaller and their spurs a little closer together than those of trees pruned lightly in early August and more severely in late December. The summer- and autumn-pruned trees bore more fruit than the late summer- and winter-pruned trees with Worcester but not with Cox. (2) Leader-pruned Worcesters had closer spaced fruit buds than when the leader was not cut, and for the first 6 years trees with the leader uncut produced a larger crop. (3) Trees planted at an angle of 45° did not differ in length or girth of main stem, 3 years after

planting, from those planted erect and lowered to an angle of 45° 3 years after planting.

468. HEWETSON, F. N. 634.11-1.541.11
Growth and yield of McIntosh apple trees as influenced by the use of various intermediate stem pieces.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 181-6, bibl. 2.

Observations were made in Michigan on McIntosh apples double worked on Duchess, Haas, M(alling) II, M. IX, M. XII, McIntosh, Dudley, Hibernal and other intermediates. The method of working was to insert the scion bud in the stem of the intermediate after the latter had been grown for a year in the nursery. The trees were in two groups, one having grown for 7, the other for 8 years in the orchard. Over this period tree size was found to be significantly reduced by M. IX as an intermediate. Yields were significantly increased by the use of Haas and similarly reduced by the use of Dudley as intermediate. M. IX hastened maturity and increased colour in fruit. Results are discussed.

469. MCCLINTOCK, J. A. 634.11-1.541.11
Preliminary studies on adapting Virginia Crab to top-working with Stayman.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 177-80, bibl. 6.

Bud sports of Stayman were topworked successfully on Virginia Crab trees, which had been unsuccessfully worked with Stayman itself some 6 years before.

470. SHAW, J. K., AND SOUTHWICK, L. 634.11-1.541.11
A second report on some lethal rootstock scion combinations.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 198-202, bibl. 3.

Further evidence of uncongeniality of certain apple varieties on Northern Spy 227. Failure is attributed to specific conditions in both scion and stock, but whether any communicable disease is involved is not known. [For previous article see *ibidem*, 44: 239; *H.A.*, 14: 1499.]

471. PASSECKER, F. 634.21-1.541.11
Lebensdauer und Veredlungsunterlage bei der Marille (Aprikose). **(Longevity in apricots as affected by rootstocks.)**
Gartenbauwiss., 1944, **18**: 231-52, bibl. 6.

The short life of so many apricot trees caused the author to make a survey of reputedly old and well-cropping trees in Germany, details of which are reported. Apart from the effect of the locality, the rootstock was found to exert a great influence on the longevity of the tree. The following conclusions as to the suitability of rootstocks under specified conditions were reached: (1) In a warm and dry climate on permeable soils apricot seedlings—particularly those derived from small-fruited trees, according to experienced growers—have proved most suitable. Vegetative propagation of selected clones was shown to be practicable. (2) In a somewhat moist and cool locality and on less permeable soils long-lived trees were produced by working on Hauszwetschke and on seedlings of two local types. Clones of these rootstocks are now being obtained by earthing up. No opinion can be formed yet on such rootstocks as common plum, etc., since these have not been on the market long enough. (3) Cherry plum seedlings (*Prunus cerasifera* var. *myrobalana* and var. *atropurpurea*, syn. *P. pissardi*) have given such bad results that their further use in Germany is strongly deprecated. (4) Sloe (*Prunus spinosa*) has not proved its worth yet and caution seems necessary. A selection of clonal types might provide valuable material for dwarfing rootstocks. (5) Almonds should be used only in sufficiently warm localities with permeable soil. Clonal propagation seems practicable. (6) In general, grafting should be given preference to budding. Especially in the case of hard-wooded plum types the rootstock should be used to form the stem, since it is less susceptible to mechanical and frost injury. Intermediate stem builders have not been a success with apricots.

Pollination.

472. MODLIBOWSKA, I. 581.162.3: 634.11 + 634.13
Pollen tube growth and embryo-sac development in apples and pears.
J. Pomol., 1945, **21**: 57-89, bibl. 47.

The work described here was done at the John Innes Horticultural Institution. Incompatibility in apples and pears is due to physiological reactions occurring between the pollen tube and the stylar or ovarian tissue. The reactions are genetically controlled and pollen cannot function in a style or ovary which carries the same incompatibility genes as the pollen. Three types of pollen tubes of apples and pears are distinguished and their reactions described, under the heads: incompatible tubes, semi-compatible tubes and compatible tubes. The growth of all is accelerated by warmth, but compatible tubes are the fastest growing at all temperatures and generally reach the ovary earlier than the semi-compatible. *Self pollination.*—In self-pollinated diploid apples both incompatible and compatible pollen tubes were found, but in pears only incompatible. In all triploids both incompatible and compatible pollen tubes were present and occasionally fertilization occurred following selfing. In the tetraploid pear (Bartlett), somatically derived from a self-incompatible diploid, both incompatible and many compatible tubes were present. The view is taken that polyploidy can remove the bar to self-incompatibility and that this is due to the occurrence and interaction of two different incompatibility genes in the pollen. *Cross pollination.*—Most, though not all, pollinations between diploids are compatible in both apples and pears. Rate of pollen tube growth, especially at the warmer temperatures, is much faster in compatible cross-pollinations than in selfed. Triploids × diploids show more frequent incompatibility than diploids × diploids because the chance of the incompatibility genes of the pollen meeting similar genes in the style increases with the rise in chromosome number of the female plant. The study of tetraploids × diploids in pears shows that the pollen tubes of a diploid variety are incompatible with the styles of a tetraploid that has arisen by the doubling of the chromosome number of the pollen variety. Diploid × triploid pollinations show low fertility due to high pollen sterility, though no completely incompatible pollinations were found. Triploid pollen tubes grow more slowly and effect fertilization later than those of diploids. Triploid × triploid pollinations show slow pollen tube growth, late fertilization and low fertility. The rate of growth of the tubes differs according to the chromosome number of the pollen parent.

473. WET, A. F. DE. 634.11: 581.162.3
One reason for low yields of apple trees.
Fmg S. Afr., 1945, **20**: 81-3.

The significance of cross pollination for certain apple varieties is shown in tabular form.

474. APRIL, N. 634.1/7: 581.162.3: 638.12
Bees for pollination in the orchard.
A.R. Quebec pomol. Fruitgr. Soc. 1943, 1944, pp. 46-50.

An account of the work of bees in respect of orchard pollination. The matter of bee poisoning is taken seriously in Canada and regulations are in force which prohibit the use of arsenical or other bee-poisonous sprays during the time of blossoming.

475. ECKERT, J. E. 638.12: 632.951/2
The avoidance of bee poisoning.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 11-7.

Some possible solutions of the bee poisoning problem are discussed. 1. Keep the bees out of the poisoned areas at

all times. This is not a good solution, for it will affect adversely the pollination of orchards. 2. The orchardist might employ packaged bees for pollinating and kill them afterwards. This is being done on a limited scale but could not be done extensively if only because of shortage of bees. 3. The insect control programme in a community might be regulated so as to bring the hazards of bee poisoning to an economic level. This involves not only spray schedules of orchards but those of other and later crops, e.g. potatoes. Much can be done in the orchards by the proper timing of sprays. If trees are not sprayed till three-quarters of the petals have fallen there will be minimum injury to bees, blossoms will be pollinated effectively and with less spray damage. Cover crops are definitely dangerous to bees if in bloom when arsenicals are applied. Dusts are more harmful than sprays, especially if applied by aeroplane, for they drift all over the country. Spring spray applications could be reduced if the overwintering forms of codling moth were killed on the tree and if neglected orchards and isolated trees were sprayed under some communal system. Cryolite, phenothiazine or genicide are less toxic to bees than arsenicals and should replace them.

476. DUHAN, K. 634.21: 581.162.3
Untersuchungen über die Blüh- und Befruchtungsverhältnisse bei Marillen. (Flowering and pollination in apricots.)
Gartenbauwiss., 1944, **18**: 253-65, bibl. 9.

As comparatively few data are available on the flowering and pollination of apricots, the problem was investigated for 3 seasons, 1941-43, at an experimental apricot orchard at Krems on Danube, Austria. A study of 27 varieties and strains showed that the overlapping of flowering periods allows of cross pollination in every case. None of the varieties flowers sufficiently late to merit consideration as being less susceptible to late frosts. Pollen germination of all varieties was found to be good. Two varieties proved completely self-sterile (Grosser Kremser and Schöllschitzer Marille), while a third was practically self-sterile (Early Hungarian Yellow). Another, Breda, was doubtful, but the rest were completely self-fertile. Full results are given in diagrams and tables.

Growth and nutrition.

477. MACDANIELS, L. H., AND COWART, F. F. 634.11: 581.144.4+581.44
The development and structure of the apple leaf.
Mem. Cornell agric. Exp. Stat. **258**, 1944, pp. 29, bibl. 18.

A general description, illustrated by photomicrographs, of the development and structure of the apple leaf, omitting anatomical differences associated with variety, age and environmental conditions during growth. Leaf ontogeny follows the same general pattern already familiar in other dicotyledonous leaves. The development of unfolding buds is discussed in connexion with covering by spray materials. The anatomy of the mature lamina and petiole are related to photosynthetic function. J.P.R.R.

478. DUSTMAN, R. B., AND FISH, V. B. 581.192: 634.11+634.23
Sugars in apple and cherry blossom.
Plant Physiol., 1944, **19**: 603-14, bibl. 8.

At the West Virginia Experiment Station blossoms of 12 varieties of apple at or near full bloom and blossoms and fruit buds of 3 varieties of cherry from dormancy to full bloom were analysed for individual sugars, using a system of semi-micro determinations. The method used to determine levulose has not previously been reported; it tends to give values that are slightly high but that are believed to be reasonably accurate. Levulose was always present in greater quantity than dextrose or sucrose in apple buds both at the bursting stage and in the two apple varieties examined in the winter dormant stage. Its predominance is related to the fruiting process and extends from the dormant fruit bud on into the matured fruit. In the cherry buds at all stages levulose exceeded dextrose but sucrose sometimes exceeded either hexose sugar. In a single analysed mature cherry fruit dextrose exceeded levulose and sucrose was absent.

479. PANOSJAN, A. K. 634.743-1.847
The biology of the nodules on the roots of *Elaeagnus angustifolia*. [Russian.]
Microbiological Symposium Acad. Sci. U.S.S.R. Armenian Branch Biological Inst., 1943, **1**: 147-70.

Elaeagnus angustifolia adapts itself to many types of soil—even saline soil; but it requires adequate moisture. The fruit has long been an important article of diet in Armenia. It keeps fresh for a long time, in a dried state it can be used during the winter, and it has medicinal properties applicable to alimentary disorders. This last-mentioned property, it is believed, may be attributed to the presence of tanning substances, 4% to 5% in amount. Furthermore, the tree bears nectar. It is invariably propagated by cuttings, for the seeds have a thick and impenetrable coat and therefore germinate slowly. Seedlings and cuttings grown in sterilized soil formed none of the nodules which usually develop on the roots; but ordinary unsterilized soil, or that which has been infected with the bacteria isolated from the nodules, gives rise to numerous nodules sometimes clustered together like bunches of grapes. They are more numerous on the roots of cuttings than of seedlings. Several strains of bacteria were observed, only some of them being capable of producing nodules. They differ from the nodule bacteria of vetch and sainfoin in that neither can infect the other. They have therefore been provisionally called *Bacterium radicicola* var. *pschat*. Young plants artificially infected with the active strains grew more vigorously than the control plants, and contained more nitrogen in the foliage. The effect of the nodules was slightly more than equivalent to nitrogenous manuring.

480. BAKER, G. A., AND BROOKS, R. M. 634.1/7: 581.145.1
Climate in relation to deciduous fruit production in California. III. Effect of temperature on number of days from full bloom to harvest of apricot and prune fruits.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 95-104, bibl. 21.

In attempts to foretell the actual date of harvest from date of full bloom of Royal apricots and French prunes at Davis, Calif., accumulated seasonal heat units were used (see also *H.A.*, 11: 393; 12: 1240, 1241; 13: 57). The accuracy of estimates for apricots was greatly improved but not that for prunes. The figures and method of forecasting are discussed.

481. JOHANSSON, E. (SCHULZ, F., LOEWEL, E. L., AND VAHL, E.). 634.1/7
Nyare undersökningar på fruktodlingens område. **(A review of recent fruit research.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 174-80, bibl. 11.

Among the 11 papers discussed in this review the following two German papers have not hitherto been available for abstracting in *Horticultural Abstracts*: (1) Schulz, F. Fruit growing and water supply, *Pom. Zentralbl.*, 1944, p. 10. A table indicates how much annual rainfall is required in Germany for the successful growing of apples, pears and peaches on medium-heavy soil at an average temperature of 14-17° C. for the period May to September. The figures given for apples and pears at an average temperature of 15° C. are 620 and 570 mm. respectively, provided half the annual amount of rain falls during the period May to September. Only in north-western Germany is there sufficient rain for apples to thrive also in lighter soils, in the rest of the country the annual rainfall is below 600 mm.

Comparative observations of three young orchards on different soils receiving the same amount of rainfall showed that in sandy soils growth may equal that of trees in medium-heavy soils, if irrigation is applied.

(2) Loewel, E. L., and Vahl, E. Fruit drop as a varietal character in apples, *Disch. Obstbau*, 1944, p. 193. At the Fruit Research Station, Jork, near Hamburg, a comparative study of 33 apple varieties was made in 1943. The trees had been planted in 1931. About 30% fruit drop was recorded for Schöner aus Nordhausen and Filippa, 20% for Gravenstein, 7·4% for Worcester Pearmain, 5% for Ribston and Boiken, 4% for Cox's Orange and 2% for Cellini. A relationship was observed between fruit drop and stalk formation. Fruit drop tended to be highest in varieties with a short thick stalk and a shallow cavity.

Fertilizers.

482. Boynton, D., and Compton, O. C. 634.11-1.84
The influence of differential fertilization with ammonium sulfate on the chemical composition of McIntosh apple leaves.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 9-17.

The results of trials on several plots each in 7 orchards in New York, which are discussed at some length, are roughly as follows:—In all except one orchard the average leaf weight was significantly less per sample from low nitrogen trees than in those from high nitrogen trees. Leaf nitrogen varied directly with N application, differences being significant in all but two instances in one orchard. Average K content was increased with a decrease in N applied in all orchards but the differences noted were only significant at odds of 19: 1 in two plots. In all but one orchard Mg increased with increased N application but only significantly in 3 instances. Ca percentages had a tendency to increase with increased N application; P percentages varied inversely with N application in all but one plot, differences being significant in 3 instances. The tendency of ash was to decrease with N application but no results were significant at odds of 19: 1. The authors note that the exact reasons for these results are not clear.

483. Smock, R. M., and Boynton, D.
634.11-1.84: 664.85.11
The effects of differential nitrogen treatments in the orchard on the keeping quality of McIntosh apples.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 77-86, bibl. 13.

Indications rather than conclusions are given by this study of the effects of nitrogen on storage qualities. These indications concern firmness of apple flesh and softening during storage, development of fruit colour, the amount of soluble solids, development of brown core after storage and development of scald.

484. Nasharty, A. H. 634.25-1.84
Accumulation of nitrogen from different sources by peach trees.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 5-8, bibl. 1.

In experiments at Davis, Calif., on 17-year-old Phillips Cling peach trees the appearance of nitrogen in 1-year-old shoots was simultaneous and its amount roughly the same following autumn application of ammonium sulphate, calcium nitrate or urea.

485. Overholser, E. L. 634.23-1.8
Review of literature pertaining to fertilizing cherries.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944. 1945, pp. 93-100, bibl. 15.

Fertilizing here means the application of artificial manures and is chiefly concerned with the beneficial effects of nitrogen. P and K either alone or in combination have given little benefit and do not, so far as is known, neutralize or reduce the effects of excess N.

Soil management and cultural practice.

486. (Surrey War Agricultural Committee.)
631.67: 634 +635
Irrigation of horticultural crops.
Fruitgrower, 1945, **99**: 212, 217.

Under the heading "Horticulture's water needs" the *Fruitgrower* presents a report of the conference on the irrigation of horticultural crops recently held at the Technical College, Guildford. Mr. E. E. Skillman (Ministry of Agriculture) speaking from an engineer's viewpoint outlined the types of irrigation and discussed plant and appliances. Dr. W. S. Rogers (East Malling) explained the need for water in the plant's life and recounted some of the benefits and mishaps observed during his experimental work with strawberries. Research was needed to establish the relation between soil-moisture meter records and the degree of availability of such recorded moisture to plants. Mr. Poupart, who uses irrigation on his farms, stated that early cauliflowers, mint, summer- and autumn-maturing lettuces and cos lettuce always benefited and that marrows and cabbages generally did. Results were not good with beet and onions. Other uses were outlined. Mr. F. A. Secrett speaking of his own experiments described his plant and layout in detail and said that finding surface irrigation would soon ruin his land he applied the water by means of overhead sprays. He described the best manner of employing these. His spray lines with a pressure of 80 lb. to the square inch could irrigate 4 acres at a time, giving 24,000 gal. in 8 hours. The addition of 8 lb. of potassium nitrate to the irrigation water gave a better response than 2 cwt. per acre as a top dressing. Irrigation with him began after a fortnight of dry weather. At Cambridge the equivalent of 2 in. of rain had given 40% increase and 4 in. 80% increase in carrot yields. Cauliflowers should be irrigated before the curd had formed or damage might result and irrigation of cauliflowers on the late afternoon or evening of an expected frost or immediately after a frost was of value in reducing injury. Lettuces in dry weather were irrigated at the last moment so as to catch the market at peak prices. There was little danger of scorching if the irrigation water was aerated to about 5% oxygen, and it could safely be applied in the middle of the day at a temperature equal to that of the plant tissue. Dr. Rogers remarked that conditions reducing frost damage to cauliflowers would not necessarily be equally effective with strawberry blossoms. A method of spraying frost-threatened strawberry blossoms with a glycerine solution could not be properly tested till after the war.

487. Rogers, W. S., and Raptopoulos, T.
634.11-1.874
Cover crops for fruit plantations. I. Short term leys.
J. Pomol., 1945, **21**: 120-39, bibl. 47.

The effect of 5 cover crops (rye grasses, clovers and lucerne) are compared with those of clean cultivation in an apple plantation at East Malling Research Station. The trees were on M. IX rootstock and 12 years old. Large amounts of green material were produced by the cover crops. The clover markedly stimulated the growth of the grasses when mixed with them. The roots added nearly as much organic matter to the soil as the green tops. The cover crops checked tree growth while growing but stimulated it after being turned in. The crops giving the biggest check later gave the highest stimulation. The trees, however, had not quite caught up with the clean cultivated controls in the two years following the turning in of the cover crops, probably because of the competition for nutrients and water. Manures were withheld except for a little sulphate of ammonia

applied at certain stages to cover crops and controls. Total weight of fruit over the 4-year period (i.e. 2 years of cover crop and 2 years following) was (not significantly) in favour of the cover-cropped plots. Reductions in size of fruit under cover crops during growth and increases after turning in were not significant. Fruit colour was improved during growth of cover crops but not after turning in. Cover crops reduced interveinal leaf scorch to 10% in some cases compared with 90% on the clean plots. N deficiency was marked on plots under grass but much less so under grass + clover. Legume crops had less effect on the interveinal scorch while growing but a more beneficial one after turning in. In this connexion the possible K: Mg ratio effect is discussed. The conclusion is reached that short-term cover crops should be suitable for vigorous trees on soil not less than 2½ ft. deep with rainfall not under 26 in. per annum. A cover crop wrongly chosen or wrongly treated can do harm.

488. Harlow, L. C., and Whiteside, G. B. 631.4: 634.1/7(716)
Soil survey of the Annapolis Valley fruit growing area.
Publ. Canada Dep. Agric. **752,** 1943, pp. 92 + 3 maps, being *Tech. Bull.* **47.**
Data are presented on the adaptability and productivity of the soils in the Annapolis Valley fruit growing area, Nova Scotia, supported by a large soil map in 3 sections. Among the points noted as requiring attention is a pronounced deficiency in available phosphoric acid and a relatively low organic matter content. Recommendations given include the raising of the pH value to 5·6·5 by a specified limestone treatment, the increase and maintenance of organic matter in the soil by various methods, and applications of 2-12-6 or 5-10-5 fertilizer mixtures at the rate of 500 lb. per acre, supplemented in orchards by two applications of nitrate of soda or sulphate of ammonia at the rate of 250 lb. per acre.

489. Baker, C. E. 634.11-1.51: 581.144.2
The rooting habit of Grimes apple trees under different systems of soil management.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 167-72.
At Lafayette, Indiana, 4 trees each of 21-year-old Grimes apple, which had been submitted for many years to one of the following soil treatments:—strawy manure mulch, clean cultivation and blue grass sod, had their roots examined in 1943. No correlations could be established between treatment and root systems.

490. MacGillivray, K. D. 634.1/7-1.51
Cultivation in non-irrigated deciduous fruit orchards on the Tablelands and Western Slopes.
Agric. Gaz. N.S.W., 1945, **56**: 13-6, 20.
The following principles of cultivation are advocated for conserving moisture and organic matter in the deciduous orchard soils on the Tablelands and Western Slopes of New South Wales: (1) Maintain a weed cover or green manure crop as long as possible during the year; (2) control such cover crops with the plough or cultivator during spring and summer; (3) preserve a rough or cloddy surface. The best implements and times for cultivation are discussed. Autumn ploughing may have an unfavourable effect under certain conditions occurring in both the drier and the higher rainfall districts.

491. Edmonds, H. T. 634.1/7
Intercropping fruit plantations.
Fruitgrower, 1944, **98**: 424.
A paper given at a Fruit Conference held by the Kent War Agricultural Committee at Maidstone in November 1944. Many farmers, owing to war production needs, have intercropped their top fruit, where light and air have been sufficient, with market garden crops. Such crops have produced a considerable tonnage, though cost of production is higher than if grown in the open. If the top fruit has sof fruit below it, it is scarcely worth while to add market garde crops, though strawberries are often grown with success The chief points to consider in intercropping are: (1) th proposed spraying programme for the top fruit; (2) the cro to be sown; (3) the class of cultivation required; (4) how the crop is going to be carted from the land. A potato cro is less affected by the spraying programme than most and a 1st or 2nd early potato crop can be followed by bush marrows. Kale and rape may be grown under standard widely spaced, properly protected fruit trees and folded of with sheep. An almost necessary cultivation tool is a Baron or Baronet disc harrow, with 22 in. disc, 6 in. o 9 in. centres. If the rear section is fitted with a draw-ba to make it a separate unit, the land can be kept perfectl level and there is better control when turning at the head lands. Discing should be encouraged as a method o cleaning plantations; too much land otherwise cultivate shows the centre of the alleys basined out and the earth piled up to the trees. The land should be baulked up wit a single furrow baulking plough through the winter an then cultivated down with horse or tractor until perfectl level. Another method of ploughing and maintainin level land described requires more labour than is available in wartime. The heavy clay land of the Weald of Kent contrary to expectation, has produced market garden crop equal to the best grown on light soil.

492. Samisch, R. M. 634.11: 581.14: 632.95
The use of dinitrocresol mineral oil sprays for the control of prolonged rest in apple orchards.
J. Pomol., 1945, **21**: 164-79, bibl. 24.
In Palestine and sub-tropical countries winters are no sufficiently cold to break the rest of apple trees, with the result that there is often delayed bloom and foliage, failur of buds to open at all, bud abscission and other irregu larities. In investigations undertaken by the Rehovo Research Station, Palestine, apple trees were sprayed i February and March with 3-5-dinitro-*o*-cresol mineral oi emulsion. The spray broke the prolonged rest of the tree very effectively, as is illustrated by photographs of sprayed trees in almost full leaf while those unsprayed, growin near them, are leafless. Early spraying had a forcing effect stimulating earlier foliation, bloom and maturation, a effect which diminished with delay in date of spraying Late sprays reduced the number of buds continuing in th resting stage and increased yield the same season. Mos of the vegetative buds developed into fruit buds which bor in the following season, providing a further increase in th crop as a residual effect. The seasons of main bloom an foliage were brought closer together. Under conditions o prolonged rest bloom considerably preceded foliation Forcing was more successful with varieties which naturall bloom earlier. The treatment gave a relatively large increase in bud opening of those varieties which had a large number of dormant buds. There are, however, data t show that all apple varieties do not react similarly and th question arises and remains unanswered whether prolonge rest is one single phenomenon or involves more than on mechanism. The chilling requirement of varieties may b a complex rather than a simple property.

493. Schneider, G. W., and Enzie, J. V. 634.11-1.542.27: 632.95
Further studies on the effect of certain chemicals on the fruit set of the apple.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 63-8, bibl. 1.
Trials over three years in New Mexico indicate the possi bilities afforded for the reduction of set in apple trees by Reico, Elgetol, naphthalene acetic acid, naphthalene aceta mide and borax and the risk of injury with different prepara tions and concentrations thereof.

494. FLORY, W. S., JR., AND MOORE, R. C. 634.11-1.542.27: 632.95
Effects of thinning York Imperial apples with Elgetol sprays applied at blossom time.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 45-52, bibl. 7.
Of the Elgetol concentrations used, namely 0·3, 0·25, 0·2, 0·15 and 0·1 per cent., 0·2 proved the most suitable on weighing up all advantages and disadvantages of the different strengths.

495. ROWE, C. W. 634.11-1.542.27: 632.95
My experience in the use of Elgetol for thinning Newtown apples.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 41-2.
Elgetol applied as spray at a concentration of 1½ pints/100 gal. water and at the rate of 50 gal. per tree at the time the king blossom was just shedding its petals reduced a particularly heavy blossoming on Newtowns to reasonable proportions and left a full crop. Winesaps not in full bloom sprayed at the same time set less than a full crop, thus indicating the importance of time of application. Elgetol also completely controlled mildew on the trees. Blossom thinning and sprays applied at the right time and right concentration were useful, but there are many variables which make it dangerous. Other materials under experiment are—wax emulsion which coats the pistils and prevents pollination and a hormone which stimulates the blossom abscission layer.

496. MURNEEK, A. E., AND HIBBARD, A. D. 634.25-1.542.27
Results of thinning peaches with Elgetol and switches.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 69-71, bibl. 1.
Reasonable success was obtained in Missouri trials.

497. GARDNER, V. R. 634.1/7-1.542.27
A new material for blossom thinning, to serve as a sticker, and to reduce transpiration.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 42-4.
A very brief account is given of oil-wax emulsions evolved at the Michigan Experiment Station for the purposes named in the title and of certain drawbacks.

498. GARDNER, V. R. 634.1/7-1.542.27
A new material for blossom thinning.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 43-5.
Various oil emulsions consisting of vegetable oil, paraffin wax, bentonite and an emulsifying agent have been evolved since 1938 at the Michigan Experiment Station, the object being the production of substances that can be applied as sprays during the growing season, that are non-toxic to foliage and will reduce transpiration. One of these emulsions used on Montmorency cherries at a time of low humidity and short rainfall considerably increased size and therefore yield of cherries. The emulsions are also effective spreaders and stickers if added to spray materials; leaves treated with spray containing emulsion are found to bear twice as much insecticide and fungicide per unit area as those receiving the sprays without emulsion. Certain risks connected with the use of emulsions seem to be marked increase of sulphur injury on apple foliage and of copper on cherry foliage, possibly because of the increased sticking effect, thus more dilute or less frequent applications of fungicide when used with emulsions are indicated.

499. BATJER, L. P. 634.1/2-1.55: 577.15.04
Harvest sprays for the control of fruit drop.
Circ. U.S. Dep. Agric. **685**, 1943, pp. 15, bibl. 23.
This is a survey of American work on the use of sprays to delay fruit drop at the time of harvest. Among points made are the following:—α-naphthaleneacetic acid, α-naphthaleneacetamide and the sodium salt of α-naphthaleneacetic acid have proved equally effective with apples. For summer apples concentrations of 5 p.p.m. are generally adequate, but for autumn varieties it may sometimes be necessary to use 10 p.p.m. The most important factors are (1)—above all—time of application and (2) thorough coverage. If these are correct, a single application generally suffices. The addition to the spray of small amounts of summer oil (1 pint to 1 quart per 100 gallons) generally increases effectiveness slightly. Effects are greater when spraying is done at relatively high temperatures (80° to 85° F.) than at lower temperatures (55° to 60° F.). The sprays appear to have no direct effect on fruit maturity. Application in dust form to McIntosh trees has shown promise. Results of spraying pears, notably Bosc and Bartlett, have been satisfactory. As regards stone fruits, where premature drop is not a serious problem, harvest sprays have reduced drop in trials with apricots but have had no appreciable effect on peaches.

500. SCAMAN, J. 634.11-1.55: 577.15.04
Use of the airplane in the orchard.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 53-4.
In Washington State 1,300 acres of apples were sprayed by aeroplane, always with success, though in varying degree. The reason for the greater success of spraying with hormone in solution against fruit-drop by aeroplane compared with ordinary spraying is attributed to the high oil concentration used, 40% oil from the aeroplane and only ⅛% on the ground. The absorption of oil into the tissues is very rapid because of the large amount used. It is not necessary, it is now known, for the hormone spray to touch the stem of the apple. The rate of use is 5·5 gal. of concentrated oil and hormone per acre, the charge for application being 7 dollars per acre. The material is finely atomized and spread evenly over the tree. The equipment consists of a tank in the plane which leads to 2 rotors, one attached to each of the lower wings. These rotors turning at high speeds atomize the spray. Dormant sprays and pollen could also be applied by plane, but experiment is required.

501. BRADFORD, F. C. 634.11-1.542.24
The effect of wire girdles on apple trees in the nursery.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 173-6, bibl. 3.
Tests at Glenn Dale, Md, showed that the effect of wiring root-grafted apple tree trunks at the time of planting in the orchard has been not only increased scion rooting—which is desired—but also a considerable check in top growth, the seriousness of which appears to differ with varieties.

502. DUCHESNE, J. E. 634.11-1.542
Pruning apple trees.
A.R. Quebec pomol. Fruitgr. Soc. 1942, 1943, pp. 24-8.
Pruning methods and practice are discussed with special reference to Quebec. Preference to-day is for the modified central leader type and the best way of shaping and preserving this type is outlined. The author refers to the thin wood method of pruning worked out by Ricks and Gaston (*Spec. Bull. Michigan agric. Exp. Stat.* 265, 1935 and fully summarized in *H.A.*, 6: 281). He considers his theories are confirmed by the results obtained by these workers.

503. SINGH, L., AND LAL, G. 634.13: 664.85.13.036.5
Studies in the preservation of fruits and vegetables. Effect of maturity of William's pears (Kulu Valley, Punjab) on their canning quality.
Ind. J. agric. Sci., 1944, **14**: 167-71, bibl. 7.
(i) Firmness of Williams pears grown in Kulu Valley, Punjab, as determined by a standard pressure tester during the commercial harvests in 1937 and 1938 varied from

13 to 16 lb. and 12 to 18 lb. respectively. (ii) "Cut-out" tests on five lots of canned pears from each picking in 1937 and 1938, during a storage period of about two years, indicated that the fruit picked at 13-14 lb. pressure yielded the best results on canning and such fruits were usually found picked in the first week of August in commercial harvest at Kulu. [Authors' summary.]

504. Overley, F. L., Overholser, E. L., and Sisler, G. 634.1/2-1.536
An economic study of orchard tree removal.
Bull. Wash. agric. Exp. Stat. **443**, 1944, pp. 26.
A five-acre block of 35-year-old Winesap apple trees with the permanent trees spaced 40 × 40 feet and a semi-permanent tree remaining in the centre of each square was selected for the experiment at the Tree Fruit Branch Experiment Station, Washington. In one half of the plot half the trees were removed, bringing the number down to 27 per acre. During the four seasons 1940-43 the block from which half the trees had been removed yielded 61, 72, 77 and 100·3% respectively as much crop as the more crowded trees, while the returns caught up even more quickly in view of the higher percentage of the "extra fancy" and "fancy" grade fruits produced by the more isolated trees. The saving in labour amounted to about 25% in the widely spaced block and insect control and cover crops were more satisfactory.

Noted.

505. Aroeira, J. S. 634.1/7-1.546
(10) Formação de mudas de plantas frutíferas. **(Forming the framework of young fruit trees.)**
Ceres, 1943, **4**: 352-8, bibl. 6.

Carlsson, G. B. 634.11: 382.5(485)
Den svenska importen av färsk frukt. Synpunkter med speciell hänsyn till de månatliga växlingarna i apple- och päroninförseln. **(Swedish imports of fresh fruit with special reference to the monthly variations in the import of apples and pears.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 16-34, bibl. 6.

Clayton, B. S., Neller, J. R., and Allison, R. V. 631.62(759)
Water control in the pear and muck soils of the Florida Everglades.
Bull. Fla agric. Exp. Stat. **378**, 1942, pp. 74.

Correa, G. 634.1/7-1.536
Marcação, abertura e preparo de covas para o plantio de árvores frutíferas. **(Marking out, excavation and preparation (filling with compost) of holes for fruit tree planting in Brazil.)**
Ceres, 1943, **4**: 359-66, bibl. 3.

Hildebrand, E. M. 634.1-1.542.27: 632.95
The mode of action of the pollenicide, Elgetol.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 53-8, bibl. 6.

Lundin, Y. 634.1/7(485)
Landets bestånd av fruktträd och bärbuskar. **(Stocktaking of fruit trees and soft fruit in Sweden.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 119-22.

Meyer, A. 634.11: 581.47
A study of the skin structure of Golden Delicious apples.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 105-10, bibl. 8.

Tufts, W. P. 634.1/8(794)
Three decades with California deciduous fruit problems.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 498-508.

Tukey, H. B. 634.25-1.521.5
Variations in type and germinability of commercial lots of peach seed used by the nursery trade.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 203-10, bibl. 7.

Tukey, H. B., and Brase, K. D. 634.11-1.541.11
Differences in congeniality of two sources of McIntosh apple budwood propagated on rootstock U.S.D.A.227.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 190-4, bibl. 4.

SMALL FRUITS, VINES AND NUTS.

506. Grubb, N. H., and Harris, R. V. 634.711
The planting and maintenance of raspberry cane nurseries.
Gdnrs' Chron., 1945, **117**: 27, 33-4.
Fruitgrower, 1945, **99**: 43-4, 62, 179-80.
The only safe method whereby the continuous supply of true to name virus-free canes can be assured and thus deterioration of the stock, otherwise inevitable, be prevented is here described as worked out at East Malling Research Station. Raspberries may be divided into virus-sensitive (Norfolk Giant) and virus-tolerant (Lloyd George and Newburgh). The sensitive kinds can be rogued for virus by eye; the tolerant varieties can only be partially rogued or, if, like Newburgh, they display no symptoms, not at all. Norfolk Giant, the only widely grown sensitive to-day, has a high degree of resistance to the virus mosaic diseases and special isolation of cane nurseries is unnecessary, since what little infection there is can be at once detected and eradicated. Tolerant varieties, which comprise the great majority of named and new seedling varieties, can only be safely propagated by isolating tested stock from all other sources of infection (raspberries). Thus cane nurseries of these sorts should be situated as far as possible from raspberry cropping areas and only one tolerant variety propagated at a time. The sensitive Norfolk Giant, however, can be grown at the same time. The cane nursery should be established on soil fairly free from invasive weeds and one into which it is easy to put a spade, e.g. stony ground. The freshly planted canes must be cut down before growth begins to at least one but preferably three good buds. Too low cutting and over-deep planting will hinder or prevent growth. Cane nurseries are not allowed to fruit, and to prevent this the old stubs, which may produce some fruit, must be cut away before it ripens, or adventitious seedlings will spring up and the stock become mixed. If new cane growth lags the old stubs can be deblossomed and as many leaves left on as possible. To get a good crop of canes the strong or parent shoots are dug out each year and may be used elsewhere. In the case of weak plants with canes under 2 ft. high all canes should be cut to ground level. As many roots must be left in the ground as possible and central canes which are removed are cut close in by means of the spade before lifting. Cane nurseries produce a good crop of canes the second year and this time all are dug, weak and strong. Canes are best planted in beds 3 ft. wide with a 3 ft. strip between each bed and 15 ft. between varieties, in order to prevent mixing of roots. The plants are 2 ft. apart in the rows. The 3 ft. strips between the beds are kept clean and when the planted rows begin to fail in vigour they are transferred to the empty spacing and their sites left fallow. The production of 25,000 canes per acre per season may be considered a low figure. The article contains much other important information for raspberry growers which space prevents including here.

507. State, G. L. 634.711-1.523
Methods and problems in raspberry breeding.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 255-8.
Summary of methods, problems and aims of red and black raspberry breeding at Geneva, N.Y.

508. HARRIS, G. H. 634.711(711)-1.811.9
The effect of micro-elements on the red raspberry in coastal British Columbia.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 300-2.
On the light sandy soils of coastal British Columbia the addition of borax to the soil significantly increased vitamin C content and dry weight of red raspberries. Copper sulphate had no apparent effect. Manganese sulphate increased yield, carbohydrate content, vitamin C and dry weight. Zinc sulphate increased carbohydrate content and dry weight. Results indicate that B, Mn and Zn deficiencies are likely to become noticeable in future on these soils.

509. CLARK, H. E., AND POWERS, W. L. 634.71-1.84
Leaf analysis as an indicator of potassium requirements of cane fruits.
Plant Physiol., 1945, **20**: 51-61, bibl. 22, being *Tech. Pap. Ore. agric. Exp. Stat.* **437.**
Black raspberry and boysenberry fruits were found to accumulate less potash than leaves as a result of potash applications and the conclusion is reached that the potash requirements of these cane fruits are more accurately assessed by the Neubauer test than by leaf analysis. The beneficial effects of potash applications under the conditions of the experiment upon cane diameter, foliage, firmness of berries and yields are recorded, the soils being silt loams which had been cropped to grain for 50 years. The critical level of potassium in black raspberry and boysenberry leaves proved to be 0·20% and 0·50% respectively, while normal black raspberry and boysenberry leaves had a potassium content of 0·47% and 1·00%.

510. MARTH, P. C., AND MEADER, E. M. 577.15.04: 634.714
Influence of growth-regulating chemicals on blackberry fruit development.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 293-9, bibl. 12.
At Beltsville, Md, the application in ordinary spray form and in two instances also in liquefied-gas aerosol form of indoleacetic acid, indolebutyric acid, β naphthoxyacetic acid and 4-chlorophenoxyacetic acid to a rather unfruitful blackberry seedling during two stages of flowering resulted in a significant increase in berry weight in all cases.

511. OFFORD, H. R., QUICK, C. R., AND MOSS, V. D. 634.72: 581.162.3
Self-incompatibility in several species of *Ribes* in the Western States.
J. agric. Res., 1944, **68**: 65-71, bibl. 9.
Ribes roezlii, R. glutinosum, R. nevadense and *R. viscosissimum* proved self-incompatible in pollination tests made at the Botanic Garden of the University of California at Berkeley. This fact should be of great help in the control of blister rust (*Cronartium ribicola*) in the white pine areas of the western United States.

512. NILSSON, F. 634.72-1.523
Tetraploida typer inom släktet *Ribes*. **(Tetraploid types in *Ribes*.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 130-4, bibl. 2.
Tetraploid gooseberry, red and black currant plants and an amphidiploid *Ribes nigrum* × *grossularia* hybrid are described.

513. CHANDLER, F. B. 634.73
Composition and uses of blueberries.
Bull. Me agric. Exp. Stat. **428,** pp. 37, bibl. 19.
The results of experiments at the Maine Agricultural Experiment Station on the composition of the blueberry and its uses in the home are presented and the literature is reviewed. Commercial adaptations of the results are suggested in footnotes and in the appendix, where data on the composition of whole blueberries and blueberry juice of different varieties and origin are tabulated in detail. The storage of blueberries—by methods very similar to those used for strawberries and cherries, the construction of a fruit press and the manufacture of blueberry jelly on a commercial scale are also discussed. Trials showed that blueberries are dehydrated more readily than many fruits and vegetables, in 2 hours with 24 in. of vacuum, a temperature of 230° F. and 1½ lb. of berries per square foot of tray.

514. CULPEPPER, C. W., CALDWELL, J. S., AND DARROW, G. M. 634.73: 664.85.73.047
Variety tests of cultivated highbush blueberries for dehydration.
Fruit Prod. J., 1944, **24**: 37-40, 59, bibl. 11.
In a test of 14 varieties of the cultivated highbush blueberry (*Vaccinium australe* and *V. corymbosum*) for dessert fruit quality when reconstituted after dehydration, Atlantic, Jersey, Katharine, Pemberton, Rubel and Sam proved the best. The order of preference was altered when sugar and other ingredients were added and the fruit was used for other purposes.

515. KRAMER, A., AND SCHRADER, A. L. 634.73: 581.144.4: 581.192
Significance of the pH of blueberry leaves
Plant Physiol., 1945, **20**: 30-6, bibl. 24, being *Sci. Pap. Md agric. Exp. Stat.* **A80.**
The pH value of blueberry leaf sap was found to differ from that of most other cultivated plants in that it is 2-3 full points lower, that it is lower in the younger than in the older parts of the plants and that it increases as a result of deficiencies or diseases. The isoelectric point of the soluble leaf proteins was approximately at pH 5·0, while the pH of young healthy leaves was about 3·5. In a discussion of the significance of these results the following questions are asked: "Is it not probable that the amphoteric proteins, in contrast to their behavior in most plants, act in the blueberry as cations? Then if some of the plant proteins act as cations, would that not partially explain the preferential absorption of anions; and if anion radicals are absorbed in excess, would it not be difficult to keep iron in the blueberry plant in the reduced, available form, thus explaining the frequent reports of iron deficiency in blueberries? Furthermore, in the presence of relatively large quantities of anion radicals which in themselves may serve as oxidizing agents, would there not be less need for the oxidizing effect of the manganese ion, thus explaining the absence of a beneficial effect on blueberry growth from the application of manganese?"

516. MERRILL, T. A. 634.73-1.4-1.8
Effects of soil treatments on the growth of the highbush blueberry.
J. agric. Res., 1944, **69**: 9-20, bibl. 6, being *J. Art. Mich. Agric. Exp. Stat.* **670.**
The death of many highbush blueberry plants in a 14-acre field at Grand Junction, Mich., led to an investigation of the conditions required by this fruit. Analyses of the soil, a sand of a type considered suitable for the growth of blueberries, showed that there was no lack of available nutrients, but that the pH value was extremely low, namely 3·2. The raising of the soil pH value to 3·8 by two applications of ground limestone sufficed to restore normal growth in the plantation and to remedy all symptoms of leaf scorch and defoliation. A positive correlation was found to exist between total growth and the total nitrogen and phosphorus content in the tops of the plants. With plants grown in muck soil, their nitrogen and potash content was related to the total growth made. Since muriate of potash proved to have a deleterious effect, sulphate of potash should be used in fertilizer mixtures. The field experiments were largely supported by pot cultures.

517. MEADER, E. M., AND DARROW, G. M. 634.73: 581.162.3
Pollination of the rabbiteye blueberry [*Vaccinium ashei*] and related species.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 267-74, bibl. 8.
Both in the rabbiteye blueberry and other *Vaccinium* species tested in N. Carolina, cross pollination resulted in increased berry size and seed content and in earlier ripening.

518. FLOOR, J., AND ROGERS, W. S. 634.75-1.521
Key for the identification of the commonly cultivated commercial varieties of strawberries.
J. Pomol., 1945, **21**: 34-40, bibl. 3.
An identification key, based on leaf characters and designed especially for use with plants in runner beds, is given for the strawberry varieties Royal Sovereign, Huxley, Sir Joseph Paxton, Tardive de Leopold, Oberschlesien, Mme. Lefebvre, Western Queen, The Duke, Early Cambridge and Perle de Prague. The characters employed are defined and a table is supplied which gives details of other distinguishing characters of these varieties. [Authors' summary.]

519. LINEBERRY, R. A., BURKHART, L. V., AND COLLINS, E. R. 634.75-1.8
Fertilizer requirements of strawberries on new land in North Carolina.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 283-92, bibl. 12.
On newly cleared land in N. Carolina, consisting of a fine sandy loam soil, phosphatic and nitrogenous manuring proved essential. The necessity for potash was not so obvious.

520. HULL, H. H., AND STEVENS, N. E. 634.76-1.415
Changes in pH and in base-exchange properties of cranberry soils following the use of alkaline water.
Soil Sci., 1944, **58**: 405-8, bibl. 3.
Greenhouse experiments carried out at Wisconsin University suggest that the regular use of alkaline water for flooding cranberries will eventually result in an undesirable rise of the soil pH value accompanied by a decline of yield.

521. KERTESZ, Z. I. 634.872: 581.192
The chemical composition of maturing New York State grapes.
Tech. Bull. N.Y. St. agric. Exp. Stat. **274**, 1944, pp. 13, bibl. 5.
In an attempt to work out a maturity standard for N.Y. State grapes it was found that the seasonal and local variations in the pH value, acid content, specific gravity and sugar content of several grape varieties are much larger than those due to different degrees of ripeness. Certain technical methods involved, such as the estimation of the approximate true sugar content and the use of the hand refractometer for determinations of the total soluble solids content of the juice are discussed.

522. BURGER, H. 634.51
Der Nussbaum als Waldbaum. **(The walnut tree as a forest tree.)**
Schweiz. Z. Obst-u. Weinb., 1944, **53**: 215-21, bibl. 10.
BRYNER, W.
Der Walnussbaum als Obstbaum. **(The walnut tree as a fruit tree.)**
ibidem, 1944, **53**: 229-34.
KELLERHALS, E.
Die Kultur des Nussbaums in der Baumschule. **(The cultivation of walnuts in the nursery.)**
ibidem, 1944, **53**: 284-7.
In these papers, which were read at a walnut conference held at Wädenswil in May 1944, the intensification of walnut culture in Switzerland is advocated. The propagation of walnut trees in the hot house (20° C.) and in the open (average daily temperature not less than 17·5° C.), as practised at the Experiment Station, is described. A brief description is also given of the most popular local and foreign varieties. The Swiss nurserymen have seen to it that increased demands for planting material, both for timber and nut production, can be satisfied.

523. LEWIS, R. D., AND HUNTER, J. H. 634.521: 581.192
Changes in some mineral constituents of pecan nuts and their supporting shoots during development.
J. agric. Res., 1944, **68**: 299-306, bibl. 22.
The changes in some mineral constituents of pecan nuts sampled on four different dates from 78 trees of the Moore variety at Albany, Ga, were studied in order to obtain additional data on the cause of poor filling of nuts. The tabulated analytical results show the composition of shoots and nuts at different developmental stages, the ash, N, CaO, MgO, K_2O, P_2O_5 and oil content of shell and kernel being listed separately in a special table. Since the accumulation of oil, protein and acid-hydrolysable carbohydrates in the nuts was found to coincide with the period of rapid intake of nitrogen, phosphorus, magnesium and potassium, it is important that a balanced supply of these elements is available at the time of kernel development. Calcium, which is also rapidly absorbed at the period of kernel growth, is largely deposited in the shell. The reduction of reserve materials in the shoots during the filling of the nuts, which occurs late in the season, is thought to account for the tendency of the pecan to bear biennially. A generous application of fertilizers, it is suggested, would prevent the shoots from becoming too depleted to make strong growth in spring after a good crop.

524. DODGE, F. N. 634.521-1.542.27: 632.95
Reducing the set of pecan nuts by spraying in flower with phytotoxicants.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 59-62, bibl. 6.
It was found possible in Louisiana partially to inhibit the setting of pecans by spraying with 4-1-100 bordeaux at or shortly before the time pollen first adheres to the stigmas.

525. SMITH, C. L., AND LOUSTALOT, A. J. 634.521-1.55
Effects of harvest date and curing on the composition and palatability of pecan nuts.
J. agric. Res., 1944, **68**: 395-403, bibl. 6.
The amount of total sugars increased greatly in kernels [of the pecan nut varieties Western and Success] as the date of harvest advanced; it also increased considerably during the curing periods in kernels of nuts of the early and midseason harvests, the greatest increase occurring in kernels of nuts cured at room temperature with the shucks attached. The least increase of total sugars during curing occurred in kernels of nuts cured at 0° to 2° and at 50° C. Acid-hydrolysable polysaccharides decreased in the kernels during curing, and some of these substances may have been converted into sugars. The shucks lost a considerable amount of reducing sugars during the curing period, while an increase in acid-hydrolysable polysaccharides occurred at the same time. This indicates that at least a part of the reducing sugars was converted into acid-hydrolysable polysaccharides. Ether extract, or oil, increased in kernels from the early to the midseason harvest dates, after which it remained almost constant. There was a statistically significant average increase in dry matter of kernels of nuts harvested at midseason as compared with those harvested early, probably due largely to increases in the oil content. These average increases amounted to 8·4% and 7% in the Western and Success varieties, respectively. Kernels of nuts cured at room temperature appeared to be normal in flavour, colour, and texture regardless of the date of harvest. [From authors' summary.]

526. (8) BAIN, H. F., AND DERMEN, H. 634.76: 581.4
Sectorial polyploidy and phyllotaxy in the cranberry (*Vaccinium macrocarpon* Ait.).
Amer. J. Bot., 1944, **31**: 581-7, bibl. 2.

CLARK, J. H. 634.75-1.523
The place of the Lupton variety in the New Jersey strawberry breeding program.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 263-6, bibl. 2.

DARROW, G. M., WOODWARD, O., AND MORROW, E. B. 634.73-1.523
Improvement of the rabbiteye blueberry [*V. ashei*].
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 275-9.
Breeding work in N. Carolina.

DERMEN, H., AND BAIN, H. F. 634.76: 547.944.6
A general cytohistological study of colchicine polyploidy in cranberry.
Amer. J. Bot., 1944, **31**: 451-63, bibl. 8.

DODGE, F. N. 634.521: 581.145.2
A method of measuring the degree of kernel development of samples of pecans.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 151-7, bibl. 5.
By means of specific gravity determination.

MILLER, J. C. 634.75-1.523
Strawberry breeding problems.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 259-62.
Aims in Louisiana.

NILSSON, A. 634.75
Jordgubbsodlingarna i Bergsjö. **(Strawberry growing in Bergsjö, Sweden.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 98-105.

NILSSON, F., AND JOHANSSON, E. 634.75
Nya typer och hybrider inom släktet *Fragaria*. **(New types and hybrids in the genus *Fragaria*.)**
Sverig. pomol. Fören. Årsskr., 1944, **45**: 146-51, bibl. 5.

PLANT PROTECTION OF DECIDUOUS FRUITS.

527. BALDACCI, E. 631.521.6
La resistenza delle piante alle malattie. **(Disease resistance in plants.)**
Genova-Roma-Napoli-Città di Castello, 1942, pp. 261, from review *Zbl. Bakt.* IIte Abt., 1942, **105**: 259.
The work is in three parts which deal with (1) the theories of immunity, (2) factors affecting resistance, (3) possibilities of influencing resistance. The bibliography contains 740 references.

528. AVAKJAN, S. A. 634.1/7-2.1/4+2.8
A review of the diseases infecting fruit trees in the Armenian S.S.R. [Russian.]
Microbiological Symposium Acad. Sci. U.S.S.R. Armenian Branch, Biological Inst., 1943, **1**: 133-46.
A list of fungal, bacterial, and physiological diseases is given, with short notes on each. Consideration of the kind of fruit grown and of the diseases which are prevalent enables Armenia to be divided into the northern, the southern and the south-eastern districts, each of which, including the diseases occurring in it, is discussed separately.

529. ROACH, W. A., AND ROBERTS, W. O. 581.111: 632.19: 634.1/7
***Further work on plant injection for diagnostic and curative purposes.**
J. Pomol., 1945, **21**: 108-19, bibl. 7.
Improvements in the appliances for plant injection evolved by the senior author are described and illustrated. They include reduction in weight of the small containers employed for interveinal and leaf-stalk injection by the substitution of cellophane for glass. The special tools required for making the cellophane cups are described and illustrated. Experience gained in the use of the injection method with 25 different plants, including fruit trees, is recorded, with references to the appropriate literature. An improved method for the injection of solids into a tree consists in drilling a small hole through the bark, continuing it at a slightly increased diameter into the wood, introducing with the help of a metal tube and plunger the necessary chemicals in tablet form into the wood and sealing them there with a cork disc, over which the bark readily heals.

530. WALLACE, T. 632.19
Diagnosis of mineral deficiencies in crop plants.
Nature, 1945, **155**: 444-6, bibl. 8.
A summary of two lectures delivered at the Royal Institution, London, on 30 January and 6 February 1944. The methods of diagnosis discussed are visual diagnosis, foliage spraying and plant injection, chemical methods, and finally soil analysis and field trials.

531. GOODALL, D. W. 634.11-2.19
Studies in the diagnosis of mineral deficiency. II. A comparison of the mineral content of scorched and healthy leaves from the same apple tree.
J. Pomol., 1945, **21**: 90-102, bibl. 43.
The question of whether it is better in leaf analysis to sample scorched leaves or apparently healthy ones is considered. Samples of both types of leaves from a number of apple trees at East Malling Research Station were analysed spectrographically. The scorch symptoms in almost every case could be related to a low concentration of either magnesium or potash. From the data obtained and fully set out in the paper the following conclusions are drawn: The trunk can supply much more potassium than magnesium to the young leaves relatively to their requirements of the two elements. Significant seasonal changes occurred only in calcium, in which the concentration increased between July and October, and in magnesium, the concentration of which decreased in magnesium-deficient trees but increased in others. In analysis slight scorch may be an advantage but severely scorched leaves should be avoided. Sampling for magnesium deficiency is best carried out late in the season. Spur leaves are more useful than shoot-leaves for the diagnosis of potassium deficiency. Lamina samples are probably preferable to petioles for diagnosis of potassium deficiency.

532. MAIER, W. 634.11-2.19: 546.27
Boron deficiency in apples. [German.]
Phytopath. Z., 1944, **14**: 613-28, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 204-5.
The symptoms of boron deficiency in apples, as they become manifest in Germany, are thoroughly described and illustrated by a number of photos. Although symptom expression is manifold, it was found to vary typically according to whether it occurred early or late in the season. Deficient apples were found to have a boron content of 10-25 mg. per kg. of dry matter as against 40-150 mg. in healthy fruit. A treatment of the branches in 1940 and 1941 consisting of the introduction of borax in solid form or injections of liquid boric acid gave excellent results in 1943. The trouble was also controlled by applying borax as a fertilizer. One attempt was made to remedy the deficiency by sowing grass under the diseased tree, but no clear results have been obtained.

* N.B.—This is being reissued by the Bureau in August 1945 as Technical Communication 16, obtainable from I.A.B., Central Sales Branch, Penglais, Aberystwyth, 1s. 6d. post free.

533. Boynton, D., and Burrell, A. B. 634.11-2.19: 631.811.6
Potassium-induced magnesium deficiency in the McIntosh apple tree.
Soil Sci., 1944, **58**: 441-54, bibl. 20.
Magnesium-deficiency leaf blotch was induced in McIntosh apple trees [at Cornell University] on acid soil low in exchangeable bases as a result of fertilization for 3 or more years with muriate or sulfate of potash. Decrease in leaf magnesium and increase in leaf potassium accompanied the appearance of the symptoms. The orchard studies and accompanying greenhouse studies seemed to indicate that the appearance of magnesium-deficiency leaf blotch resulted primarily from the competitive effect of potassium at the root surface or within the tree. The potash fertilization also caused increased exchangeable potassium and decreased exchangeable magnesium in surface soil under the trees. Twelve years of spraying chiefly with wettable sulfurs, accompanied by annual applications of ammonium sulfate, caused marked acidification of the soil under some trees affected by magnesium-deficiency leaf blotch. [Authors' summary.]

534. Alben, A. O., and Hammar, H. G. 634.521-2.19: 546.47
The effect on pecan rosette from applications of zinc sulfate, manure and sulfur on heavy-textured alkaline soils.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 27-32, bibl. 3.
Experiments on Texas and Louisiana clay soils show that the treatment of pecan rosette with a combination of zinc sulphate, manure and sulphur (100 lb. zinc sulphate + 50 lb. sulphur + ½ cubic yard dairy manure per tree) was effective and considerably more economical than treatment with zinc sulphate alone.

535. Lindner, R. C., and Luce, W. A. 634.1/7-2.19: 546.47
Zinc treatment for the control of rosette or little leaf of fruit trees.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 154-9, bibl. 9.
Rosette of fruit trees in U.S.A. is a zinc deficiency disease, though there are other contributing factors which are not wholly understood. Sometimes the zinc content of affected trees is not lower and may even be higher than normal trees, but the application of zinc usually brings about a recovery. Excess phosphorus is often associated with zinc deficiency, i.e. if the trees take up more phosphorus than is necessary they require more zinc to balance it. For severe rosette a dormant spray (February) at a concentration of 25 to 50 lb. zinc sulphate per 100 gal. water is recommended, for mild rosette the concentration can be 15 lb. per 100 gal. Another treatment is zinc oxide or basic zinc sulphate 4 or 5 lb. per 100 gal. added to the usual delayed dormant oil spray. Zinc in these forms is only effective when dissolved in oil. Good results have been obtained at Wenatchee on pears and early apples by spraying with 4 to 5 lb. of zinc sulphate per 100 gal. water in September after the fruit has been picked.

536. Pearse, H. L. 631.811.9: 546.711 + 546.72
Iron and manganese in plant nutrition.
Fmg S. Afr., 1944, **19**: 688-94.
The importance of a correct iron-manganese balance was demonstrated in water culture experiments with Cape gooseberry (*Physalis peruviana*) and strawberry conducted at the Western Fruit Research Institute, Stellenbosch. It was shown that plants remain healthy at widely different levels of iron and manganese, provided they are supplied in a certain ratio to one another, the optimum being approximately 2 parts iron to 1 part manganese. Deviations from the effective balance will result in the reduction of dry weight or, in a more severe case, in chlorosis. The effective balance at which deficiency symptoms will not appear was narrower in the case of strawberries than in the case of Cape gooseberries. The concentrations of iron and manganese, at which various degrees of chlorosis occur, are indicated in tables and the leaf symptoms are illustrated by diagrams and photographs.

537. (West of Scotland Agricultural College.) 632.3/4: 551.5
Plant disease and the weather. [A symposium.]
Nature, 1945, **155**: 308-9.
A brief review is given of the proceedings of a meeting arranged by the Plant Pathology Department of the West of Scotland Agricultural College, in which the effects of the weather on the incidence of plant disease was discussed by plant pathologists, mainly working in Scotland. It is not only the exterior climate which has to be studied but also continuous records are needed of the climate within the crop and a follow-up of such information by investigations with artificially controlled conditions.

538. Scarth, G. W. 632.111
Cell physiological studies of frost resistance: a review.
New Phytol., 1944, **43**: 1-12, bibl. 31.
The author, while mainly dealing with the work of the McGill group to which he himself belongs, also makes an estimate of the present status of the whole problem of frost resistance based on this work and on Levitt's review of the literature.* He considers that there are three main types of injury due respectively to (1) intracellular freezing, which occurs at the moment of rapid freezing of the tissue, (2) the mechanical effects of freezing and thawing when ice is extracellular, which are inferred to occur during fluctuations in temperature and can be actually seen on rapid thawing, and (3) the physico-chemical effect of dehydration. This occurs at the critical low temperature which marks the limit of frost endurance in the cell and is apparently the most common. As regards these three types he comes to the conclusion that they are opposed by the various hardening changes as follows:—"Intracellular freezing tends to be prevented by increased cell permeability to water because this accelerates concentration of the cell sap by the growth of ice outside the cells. (2) Mechanical injury during freezing and thawing with ice extracellular is principally prevented by the reduced 'structural viscosity' of the cytoplasm or, at least, of its outer zones. Hardy cytoplasm preserves a more fluid or ductile consistency than unhardy when exposed to equal dehydrating force. The comparison was made on plasmolysed cells but is presumed to hold for cells dehydrated by frost. Further protection is usually afforded by increased osmotic pressure and in very hardy cells by high non-solvent space, both of which reduce shrinkage and distortion of the cells. (3) Dehydration injury at the critical low temperature is prevented by reduced coagulability of the protoplasm—again notably of its ectoplasm. (4) The protein fraction which is soluble between pH 5 and 7 is twice as great in *Robinia* bark in summer as in winter. (5) Increased hydrophily of cytoplasmic proteins indicated by this chemical difference, could conceivably account for all the protoplasmic hardening changes."

539. Eades, J. A., and Wade, B. L. 632.111
Frost resistance tests with cold liquids.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 303-4.
In the preliminary experiment described peas were the material tested and the cold liquid a non-toxic anti-freeze agent, in this instance triethylene-glycolin solution with water.

* See 918.

540. EGGERT, R. 632.111: 634.25 + 634.11
Cambium temperatures of peach and apple trees in winter.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 33-6, bibl. 9.
Differences in temperatures in the cambium on the north and south sides of unpainted tree trunks amounted to 50° or even 55° F. in peach and from 30° to 35° F. in apple under certain winter conditions in experiments made in New Hampshire. Covering with white paint reduced these variations considerably, especially on clear windless days. No conclusion is reached as to the practical value of paint for this purpose.

541. RYALL, A. L., AND ALDRICH, W. W. 634.13-2.112
The effect of water deficits in the tree upon maturity, composition and storage quality of Bosc pears.
J. agric Res., 1944, **68**: 121-33, bibl. 8.
In two orchards of the Rogue River Valley district, three Bosc pear trees from a number of wet and dry plots were selected for the experiment which was conducted during 1936 and 1937. The wet plots were irrigated as required; the dry plot on sandy loam received one mid-season irrigation in 1936, while no water was applied to this plot in 1937 and to the dry plot on adobe clay in either season. The following effects on the fruits are reported as a result of water deficits beginning about 75-110 days after full bloom and continuing through the harvest period: (1) Reduction in size of fruits. (2) The percentage of dry matter was higher and the firmness of the fruit was greater, presumably owing to the reduction in water content. This shows that the standard range of firmness, as measured by the pressure tester, is no reliable index of maturity in the case of appreciable water deficits. (3) The pears were noticeably sweeter when ripened, but the fructose, sucrose and total sugar content of fruits from wet plots was generally higher when calculated on a dry-weight basis. (4) The respiratory activity was greater. This increase in respiration, which however did not shorten the storage life of the fruits, may be due to the greater number of cells per unit of dry weight. (It was found that the reduction in size with fruits from dry plots is a result of smaller cells rather than of fewer cell divisions.) (5) Water deficits did not significantly affect the storage and dessert quality unless they were so severe as to prevent the fruits from reaching commercial sizes.

542. BAWDEN, F. C. 632.8
Plant viruses and virus diseases.
Nature, 1945, **155**: 156-8.
This paper is the substance of two lectures delivered on 21 and 28 November 1944, at the Royal Institution, London. A comprehensive summary is given of the present knowledge of the nature of virus and of the complicated problems which arise during study.

543. SMITH, K. M. 632.8
Plant viruses.
Endeavour, 1945, **4**: 22-8, bibl. 8.
A brief account of our knowledge on the subject of plant viruses, supported by 10 excellent colour photographs illustrating the symptoms.

544. BAWDEN, F. C., AND KLECZKOWSKI, A. 634.75-2.8
Protein precipitation and virus inactivation by extracts of strawberry plants.
J. Pomol., 1945, **21**: 2-7, bibl. 5.
Specific antisera could not be produced [at Rothamsted Experimental Station] against extracts of virus-infected strawberry plants, possibly because of properties of the host plant. No soluble protein could be extracted from fruit, leaves, runners and roots; and aqueous extracts from all organs reduced the infectivity of tobacco mosaic virus. Except those from the fruit, all extracts contained much tannin and they precipitated serum proteins. The possible effect of this on failure to transmit strawberry viruses by mechanical inoculation is discussed. [Authors' summary.]

545. SMITH, K. M. 632.8
Transmission by insects of a plant virus complex.
Nature, 1945, **155**: 174, bibl. 4.
Rosette disease of tobacco is a complex one consisting of two undescribed viruses for which the names "vein-distorting" and "mottle" have been proposed. The vein-distorting virus cannot be transmitted mechanically, being dependent on an aphis vector, but mottle virus is easily transmitted by sap-inoculation. On the other hand the mottle virus cannot be transmitted by aphis unless accompanied by the vein-distorting virus. Experiments in which this is made evident are described. An aphis infected with the virus complex may sometimes transmit one, sometimes the other of the two components, or it may transmit the whole complex. No certain explanation is advanced. Possibly other plant viruses, apparently not insect-borne when alone, can be transmitted in the presence of another virus.

546. KVÍCALA, B. 632.8
Selective power in virus transmission.
Nature, 1945, **155**: 174-5, bibl. 4.
At the Plant Virus Research Station, Cambridge, the aphides *Myzus persicae* and *Brevicoryne brassicae*, when colonized on cauliflower seedlings infected with *Brassica Virus* 1 (cabbage black ringspot) and *Brassica Virus* 3 (cauliflower mosaic), transmit both, but the aphis *Myzus ornatus* similarly colonized picks out the cauliflower mosaic virus, leaving the other behind.

547. NATTRASS, R. M. 588.427: 632.8
The transmission of the virus of the "woodiness" disease of passion fruit (*Passiflora edulis*) by single leaf grafts.
Ann. appl. Biol., 1944, **31**: 310-1, bibl. 3.
The method described allowed of transmitting the virus by means of interspecific grafts in the genera *Passiflora* and *Tacsonia*. Successful transmissions were also made from *Passiflora* spp. to certain species of *Adenia*. The experiments were carried out at Nairobi, Kenya.

548. BENNETT, C. W. 632.8
Studies of dodder transmission of plant viruses.
Phytopathology, 1944, **34**: 905-32, bibl. 19.
Transmission of 12 plant viruses by three species of dodder, *Cuscuta subinclusa*, *C. campestris*, and *C. californica*, was studied at Riverside, Calif. The viruses of dodder latent mosaic and cucumber mosaic were transmitted to high percentages of inoculated plants by each of the three species of dodder. The viruses of curly top and spotted wilt were transmitted to smaller proportions of inoculated plants. The virus of mustard mosaic was transmitted to high percentages of inoculated plants by *C. californica*, but to low percentages by the other two dodder species. The virus of tobacco etch was transmitted to all inoculated Turkish-tobacco plants but was not transmitted by either of the other species. The movement of the viruses of curly top and cucumber mosaic in dodder stems was much more rapid toward growing points and away from the host than in the opposite direction. Viruses appear to be acquired by dodder mainly by movement from the host into the parasite through the phloem with the food materials. Infection probably takes place: (*a*) by movement of virus from the phloem of dodder through the haustorium into the phloem of the host counter to the prevailing direction of food movement, and (*b*) by passage from the parenchyma of the haustorium into that of the host through plasmodesmatal strands or from naked protoplasm of invading hypha-like cells. It is suggested that infection by yellows-type viruses may be effected by the first method and infection by mosaic-type viruses chiefly by the second method. [From author's summary.]

549. WALLACE, T., SWARBRICK, T., AND OGILVIE, L. 634.11-2.8

Some new troubles in apples; with special reference to variety Lord Lambourne.*

Fruitgrower, 1944, **98**: 427.

Four abnormal conditions have recently been recognized in the apple Lord Lambourne and as this apple is on the list of those scheduled as of value for further test and limited commercial planting these conditions, which have many of the characters of a virus, should be noticed. 1. *Rubbery wood*: There is a lack of rigidity in the branches which in an extreme case may take on growth characters similar to those of a weeping willow, and the spread of a 10- to 15-year-old tree may be only 4 ft. to 6 ft. The trees are uneconomic by reason of their small size; fruit quality seems unaffected. 2. *Chat fruits*: All the fruit borne may be of cull size, about 1½ in. in diameter, the colour green with a dull brownish-red flush, the stalk longer than normal and the fruits appear to be pendulous. They drop some 10 days before normal harvesting. Chat trees have inadvertently comprised up to 40% of some recent plantings of Lord Lambourne. 3. *Apple mosaic*: A mosaic occurs on the leaves as an irregular, sharply defined, creamy-white mottling distributed over the leaves in random fashion. It can be transmitted by grafting and the whole tree may be permeated from an infected graft. Neither crop yield nor quality have been affected. 4. *Flat limb*: The older portions of the branches become flattened on one side, triangular or elliptical. Flat limb is common in U.S.A. on Gravenstein, where it is regarded (without confirmation) as due to stock-scion incompatibility. One or more or even all of these symptoms may be present in the same tree. The fact that the proportion in which any one of them may be predominant over any of the others in plantations differs is regarded as some confirmation of a virus origin distributed by grafting. The troubles are widely distributed in orchards, but some of the oldest trees remain unaffected and from them it may be possible to raise sound stocks of the variety.

550. HILDEBRAND, E. M. 634.11-2.314

Control of fire blight in apple with emphasis on preventive measures.

A.R. Quebec pomol. Fruitgr. Soc. 1943, 1944, pp. 70-80, bibl. 22.

An account is given of control of fireblight canker (*Erwinia amylovora*) in apples in New York. Canker removal during dormancy of the tree is a simple matter of tree surgery and is not described. Data based on a single comparative study of several chemical paints and the acetylene torch treatment on the very susceptible Tompkins County King apple during the growing season show that 100% control was obtained with zinc chloride 43%, cobalt nitrate, cadmium sulphate and the acetylene torch. Zinc chloride resulted in considerable bark injury, with the others bark injury was but slight. The acetylene torch was effective but lacks an inexpensive heating tool. The blossom blight phase can be controlled (1) by spraying or dusting in bloom, (2) by handpicking of blossoms, or (3) by the use of a pollenicide timed to prevent fertilization and fruit set of the earlier blossoms on the truss. The control of sucking insects such as aphis will not injure the tree and has shown more promise than spraying the tree with bactericides. Three cases are cited of growers who have eliminated both phases by a systematic routine of canker painting and of blossom spraying with a bactericide and an aphis spray when the population began to build up. The time taken to clear the orchard of disease was one to two years.

551. (BROWN, J. G.) 632.314: 633.88

(Crown gall and penicillin.)

Science, 1944, Vol. **100**, No. 2600, Supplement p. 10.

Penicillin in the form of a crude extract has been used successfully to cure the soft type of crown gall on trees at Arizona University.

552. BROWN, J. G., AND BOYLE, A. M. 632.314: 633.88

Penicillin treatment of crown gall.

Science, 1944, **100**: 528, bibl. 4.

Artificially induced crown gall on *Bryophyllum* has been cured at Arizona Agricultural Experiment Station, Tucson, by the use of crude penicillin, assayed 2 to 6 Oxford units per cc., made almost automatically and cheaply through the use of a modification of the apparatus described by Clifton (*Science*, 1943, 98: 67-70). The successful method consisted of wrapping penicillin-soaked antiseptic cotton round the galls and keeping the cotton constantly saturated with the preparation, the gall under the wrapping being punctured by sterile needles in numerous places. Neither injection alone nor wrapping alone was effective. Penicillin should prove valuable in treating galls on nursery stock on the above ground parts and this, if done early, would prevent spread of the galls below ground or to neighbouring plants. It is considered noteworthy that in the case of the crown gall bacterium *Agrobacterium* (*Phytomonas*) *tumefaciens* the penicillin apparently destroys a gram-negative organism. Gram-negative bacteria have been, in general, reported as relatively resistant to penicillin.

553. SMITH, M. A. 634.11-2.3

Blister spot, a bacterial disease of apple.

J. agric. Res., 1944, **68**: 269-98, bibl. 38.

The causal organism of blister spot, which under natural conditions is confined to apple and so far has not been found outside the United States, has been identified and named *Phytomonas syringae papulans* n. var. A description is given of the organism and of its physiology and pathogenicity as well as of the symptoms of the disease, consisting of small shallow blisters on apple fruits, which in their most conspicuous stage may be mistaken for minute apple scab infections. It is believed that blister spots on overwintered fruits do not carry over the disease to the next season. The potential host range of the pathogen was determined by inoculation.

554. HILDEBRAND, E. M. 634.11-1.541.11-2.19

Myrobalan mottle and asteroid spot.

Phytopathology, 1945, **35**: 47-50, bibl. 3.

Two abnormalities, mottle and asteroid or chlorotic spot, are described on myrobalan plum (*Prunus cerasifera*) root-stocks. Myrobalan mottle, which commonly occurs in nursery plantings but affects only a small percentage of the seedlings, is a seedborne, bud-perpetuated abnormality presumably of genetic origin. Asteroid or chlorotic spot which is of unknown etiology has been frequently encountered in nursery plantings where as high as 90% of the seedlings may show symptoms. Severe symptoms result in stunting of both rootstock and scion growth. [Author's summary.]

555. OSTERWALDER, A. 634.8-2.3

Von einer noch wenig bekannten Bakterienkrankheit an Rebblättern. **(On a little known bacteriosis of vine leaves.)**

Schweiz. Z. Obst-u. Weib., 1944, **53**: 282-4.

So far, little is known about a bacterial disease of vine leaves occasionally observed in Switzerland. The symptoms, which are reminiscent of the dry, brown *Peronospora* spots, are described. Nowhere has the disease attained economic importance.

556. MIRZABEKJAN, R. S., AND AVAKJAN, S. A. 634.21-2.3

Measures for combating a bacterial wilt of apricot trees. [Russian.]

Microbiological Symposium Acad. Sci. U.S.S.R. Armenian Branch, Biological Inst., 1943, **1**: 117-31.

An unidentified bacterial disease was found to cause wilting among apricot trees. Several sprays were tested, among

* See also 935.

which bordeaux between 0·75% and 2% in strength was shown to be the most effective. A 1% solution was applied before the buds began to swell and once again 10 to 12 days after the petals had fallen. Bordeaux sometimes caused leaf scorch, hence the necessity for this interval to elapse. Other precautionary measures recommended are: the removal and burning of the diseased branches in early spring and the eradication of diseased trees in autumn.

557. MONTGOMERY, H. B. S., AND MOORE, M. H. 634.23-2.314
The control of bacterial canker and leaf-spot in sweet cherry [*Prunus avium*].
J. Pomol., 1945, **21**: 155-63, bibl. 5.
Bacterial canker, due to *Pseudomonas mors-prunorum* Wormald, was well controlled over four seasons on the susceptible Bigarreau de Schrecken cherry by spraying with bordeaux mixture both in autumn (at 10-15-100) and spring (at 6-9-100 pre-blossom). Each spraying separately contributed partial control, while spring sprays, especially that at petal-fall, controlled moderate leaf-spot. Foliage damage followed the use of this spray stronger than 4-6-100 post blossom, but the addition of edible cottonseed oil (0·75% by volume) prevented this in the one season in which it was tried. The incidence of the disease on Schrecken was influenced by rootstock and by seasonal conditions, and that of spray damage on Napoleon, Rivers, and Frogmore by rootstock. [Authors' summary.]

558. TOKIN, B., AND OTHERS. 632.953
Bactericides of plant origin. [Russian.]
From review *Priroda* [Nature], 1943, No. 4, pp. 92-3.
In this book the author describes his investigations into the bactericidal substances discovered by him in onion, garlic, radish, mustard seed, the leaves of citrus species, bird cherry and in the roots of a wild peony. He has not been able to identify their chemical composition, but he does not consider them to be ethereal oils. As regards their action it was found that mixed onions or garlic were able within a few minutes to destroy cultures of streptococci, staphylococci, bacteria of typhoid fever and the very resistant strain BCG of tuberculosis. The substances also destroyed fungi, protozoa, and the eggs of molluscs. Apart from the promising usefulness of these substances in medicine and in the destruction of micro-organisms, their presence is an interesting biological phenomenon, for it may account for the mutual protection which the wild plants in a mixed vegetation seems to afford; disease is never so prevalent among such plants as among those under cultivation. The author observed, for example, that when hemp and potatoes were grown together, the potatoes were never affected by *Phytophthora*. Such protective substances, therefore, emanate from the whole and living plant, and do not require to be liberated by preliminary maceration of the tissues. When a branch of bird-cherry and water containing protozoa were both put under a glass bell-jar, within 10 to 15 minutes the protozoa were killed.

559. VAN DE POL, P. H. 632.42: 634.11 +634.13
Onderzoek naar het beste tijdstip der voorjaarsbespuiting tegen appel-en perenschurft. *Venturia inaequalis* (Cke.) Wint. en *Venturia pirina* Ad.I. **(The timing of spray applications against apple and pear scab in spring.)**
Tijdschr. PlZiekt., 1941, **47**: 197-230, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 77.
In this first part of the investigation an account is given of the observations on the biology of the scab fungus made at Wageningen. In Holland, the disease overwinters both in the form of conidia and ascospores. In 1941 the first infections by conidia were reported one month before the liberation of ascospores. The development of ascospores was found to be influenced by apple variety and temperature, while their liberation was chiefly determined by rainfall. A method for the observation of the first liberation of ascospores is described.

560. COOLEY, J. S. 634.11-2.42
Some host-parasite relations in the black root rot of apple trees.
J. agric. Res., 1944, **69**: 449-58, bibl. 10.
July was found to be the peak period of apple root infections by the fungus *Xylaria mali*, when inoculations at monthly intervals were made from 1933 to 1935 at Arlington, Va, and Beltsville, Md. Temperature, however, is not regarded as the main contributing factor, but rather greater susceptibility of the host in midsummer owing to a seasonal diminution in its root activity. The results of various maltreatments of the trees carried out at different times support the conception that a seasonal factor affects lowering of resistance to infection.

561. COOLEY, J. S. 634.11-2.42
Susceptibility to black root rot of apple trees having various root and top combinations.
Phytopathology, 1945, **35**: 142-3.
Not one of the 21 varieties of apple roots tested at Beltsville showed outstanding resistance to *Xylaria mali*.

562. WORMALD, H. 634.11-2.4
A black apple rot caused by *Monilia cinerea*.
Gdnrs' Chron., 1945, **117**: 115.
A diseased apple of a peculiar shiny blackness was found to be infected by *Monilia cinerea* and not by *M. fructigena*, the usual cause of black apple (brown rot). Further experiments showed that *M. cinerea* will cause apples to rot and turn black in storage, that the blackness depends on darkness, in light the discoloration being brown, and on the variety of apple. Infected Bramley's Seedling turned black in the dark, whereas infected King Edward became brown but did not blacken.

563. WILKINSON, E. H. 634.11-2.48
Perennial canker of apple trees in England.
J. Pomol., 1945, **21**: 180-5, bibl. 15.
Perennial canker caused by *Gloeosporium perennans*, not previously recorded for England, has been found causing canker and dieback in three orchards following summer, but not winter, pruning. The same fungus was isolated from lenticel rots of apples grown in six counties in the South and Midlands. The disease and its habits are described. It is suggested that it should be included under the name of bitter rot, which already covers fruit rots caused by *G. album* and *G. fructigenum*. The disease in respect of the trees may be checked by a change over from summer to winter pruning, even when the fungus occurs on the fruits.

564. ROBERTS, C., AND BARRETT, J. T. 634.25-2.42
Intercellular mycelium of *Taphrina deformans* in peach fruit.
Phytopathology, 1944, **34**: 977-9, bibl. 7.
Peach and nectarine fruits from California with discoloured, slightly raised lesions were found to contain sub-epidermal *Taphrina* mycelium, while no mycelium was present in fruits with very similar symptoms but from other Californian collections.

565. BOEHM, B. 634.21-2.4
Apricot gummosis. Its spread in the Barossa District.
J. Dep. Agric. S. Aust., 1945, **48**: 273-5.
This paper, which was read at a conference of Non-Irrigated Branches of the Agricultural Bureau of South Australia in November 1944, draws attention to the alarming spread of apricot gummosis (probably caused by the fungus *Coryneum beijerincki*) in the Barossa District and demands that the disease should be made the subject of intensive research.

566. DU PLESSIS, S. J. 634.8-2.421.1
Powdery mildew or *Oidium* disease of the vine.
Fmg S. Afr., 1944, **19**: 641-8, 668.
Following a description of the *Oidium* disease of vines the results of some experiments on its control are discussed. The data, which were obtained with Riesling on the experiment farms James Groot-Drakenstein, Banhoek and Bottelary during the period 1939-42, justify the following conclusions: (1) Ordinary vine sulphur is superior to all other fungicides tested. (2) The fungicidal efficacy of sulphur is lowered by additions of lime. (3) It is not necessary to use particularly refined sulphurs; a mixture containing 80% sulphur is efficient if thoroughly applied, but a 90% sulphur is recommended for general use. (4) Best *Oidium* control was achieved by beginning the dusting programme early, viz. first half of October, followed by two dustings at monthly intervals. Applications made at these dates will at the same time control anthracnose, if supplemented by winter spraying. Since the berry is particularly sensitive to sulphur scalds during the period of rapid swelling, treatment at an early stage is desirable also from this point of view. (5) It was shown that slight early-morning dew need not delay dusting till later in the day. There was no difference in the effect as between 5 a.m. and 10 a.m. applications.

567. MCBETH, C. W., AND TAYLOR, A. L.
634.25-2.654.1
Immune and resistant cover crops valuable in root-knot-infested peach orchards.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 158-66, bibl. 6.
In areas [of Georgia] where the root-knot nematode is a problem the growth and yield of peach trees can be significantly increased by growing only root-knot-resistant and -immune [e.g. *Crotalaria spectabilis*] cover crops. Clean cultivation and trap cover crop treatments also increase the yields of root-knot-infected peach trees but neither practice is practical. [Authors' summary.]

568. SIMPSON, A. C. 632.654.2
Control of red spider mites.
Nature, 1945, **155**: 241, bibl. 5.
Experiments carried out at the laboratory of Pest Control Ltd. have demonstrated the value of dusts containing 1% of 2: 4 dinitro-6-cyclohexylphenol as the dicyclohexylamine salt against red spider (*Tetranychus telarius*) on hops and greenhouse tomatoes in Great Britain. The compound is widely used in U.S.A. against tetranychid mites. Preliminary experiments with *Oligonychus ulmi* on damsons show promising results. Tables of results at various strengths are given.

569. KUENEN, D. J. 632.654.2: 634.1/7
Onderzoek over de biologie en bestrijding van het fruitspint, Metatetranychus ulmi Koch. Verslag over het werk versicht in 1941. **(Investigations on the biology and control of the fruit tree red spider. Report on Dutch work in 1941.)**
Mimeographed, 1942, pp. 25.
The work, under the direction of Zeeland's Proeftuin, Goes, is discussed under the following heads: Winter eggs and spring emergence; Distribution of the mites on the leaves; Population counts; Dispersal; Influence of climate on increase; Feeding requirements; Insect and mite competition with red spider; Enemies; Effect of scion and rootstock; Control methods; Influence of cultural practices on red spider development; Inspection of orchards to gather data.

570. POTGIETER, J. T. 632.752
The Argentine ant.
Fmg S. Afr., 1944, **19**: 631-2, 664.
By destroying the nests of such pollinators as wild and honey bees, protecting garden and orchard pests against their natural enemies and damaging squash and pumpkin plants during the flowering period the Argentine ant (*Iridomyrmex humilis*) has become a serious horticultural pest of the Union. To poison the ants in orchards, vineyards, etc., a bait (prescription specified) should be applied in the first joint of a reed into which two small openings are bored about one inch from the top. The large top opening, which is used for receiving the poison, is plugged. The treatment should start about the beginning of July [in S. Africa] and be carried on until October, the bait being renewed every 2 or 3 weeks. In orchards every tree should be provided with a container, in vineyards heavily infested with mealy bug every vine too should be supplied with a reed for the first two seasons, after which one reed to every third or fourth vine will suffice.

571. CHRISTENSEN, J. R. 632.76
Estudio sobre el género *Diabrotica* Chev. en la Argentina. **(A study of the genus *Diabrotica* in Argentina.)** [Spanish, English and Portuguese summaries.]
Rev. Fac. Agron. B. Aires, 1943, **10**: 464-516, bibl. 38.
Beetles of the *Diabrotica* genus attack as adults the floral parts and as larvae the underground parts of a number of cultivated plants. Many species old and new are described and illustrated. There is a list of the species regarded as pests and their host plants. Dusting with rotenone at concentrations of 0·5 to 1·0% is the best means of control.

572. SHAW, H. 634.711-2.76
Field trials of dichloro-diphenyl-trichloro-ethane (D.D.T.) against the raspberry beetle (*Byturus tomentosus* Fabr.).
J. Pomol., 1945, **21**: 140-5, bibl. 8.
D.D.T. in the forms of two proprietary and one laboratory preparations was compared with *Lonchocarpus* ground root against raspberry beetle in field trials at East Malling Research Station. The control for all was equal to that of a *Lonchocarpus* spray containing 0·011% rotenone and was highly significant compared with untreated controls. One of the proprietary mixtures left a deposit on the fruit which rendered the earliest pickings unsaleable. Methods of overcoming this are suggested.

573. MENDES, C. T. 634.25-2.77
A produção de pêssegos. **(The bagging of the fruit of peaches.)**
Rev. Agric. S. Paulo, 1944, **19**: 235-9.
Failure to bag the fruit for protection against fruit fly is given as the reason for the poor quality of the crops in the State of S. Paulo, Brazil. The impermeable paper bags cost 3 or 4 centavos apiece, but they can be used twice if treated carefully and will make all the difference between the production of saleable and unsaleable fruit. The fact that the labour involved in bagging will allow of only a part of the fruit being treated is an advantage, for the surplus fruit can be thinned and thus the size of those selected will be increased. Cellophane can be used instead of paper but it is dearer. The bags must be made by sewing, not gumming, the join. Newspaper can be used for the sake of economy but has certain disadvantages. The fruit within cannot be examined to determine maturity without handling it, the paper tears easily and weathers badly and the bags can only be used once. It can be rendered impermeable by soaking in paraffin or melted vaseline but the improvement thus effected is offset by the increased cost and labour. An orchard thus properly protected can be very profitable.

574. SIMMONDS, F. J. 632.78: 632.96
Observations on the parasites of *Cydia pomonella* L. in Southern France.
Sci. Agric., 1944, **25**: 1-30, bibl. 8.
As a result of his studies in Southern France the introduction into Canada of the following codling moth parasites is

recommended: *Pristomerus*, *Ephialtes*, *Cryptus* and, if possible, *Trichomma*, *Arrhinomya* and *Meteorus*. Observations on one apple tree showed that the south-west part was more heavily attacked by *Cydia* than the rest and that the *Cydia* larvae in the south-east lower part of the tree were more heavily parasitized than the remainder. It was also found that the percentage of larvae from codling moth summer generations that went into hibernation varied with the apple variety.

575. Bovien, P., and Bolwig, N. 632.78(489)
A study of the biology of codling moth in Denmark. [Danish.]
Tidskr. Planteavl., 1944, **49**: 44, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 197-8.

A thorough study pursued for many years elucidated the life history of the codling moth in Denmark and showed why the arsenic spray applied shortly after blossoming fails to give the desired control. A repetition of the treatment at a later date is necessary, but Danish law forbids the use of arsenic later than 20 days after flowering. It is suggested that good results might be expected also from the application of contact sprays, such as nicotine.

576. Yothers, M. A., and Carlson, F. W. 634.11-2.78
Dinitro-o-cresol trunk spray against overwintering codling moth larvae.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 57-60, bibl. 4.

Carlson, F. W., and Yothers, M. A.
Methods of making a concentrated trunk spray for destroying codling moth larvae.
Proc. 40th annu. Mtg Wash. St. hort. Ass., 1944, 1945, pp. 60-1, bibl. 4.

Several methods of making DNOC spray and its application in the dormant season are described. Codling moth kill in 1941-44 trials ranged from 84% to 99%.

577. Smith, C. F. 634.25-2.78
The peach tree borer in North Carolina.
Extens. Circ. N.C. agric. Extens. Serv. **277**, 1944, pp. 8.

Time and methods of application of ethylene dichloride emulsion and paradichlorobenzene in specified dosages are indicated. With both chemicals control is increased by mounding.

578. Kalra, A. N. 634.11-2.78
Apple hairy caterpillar in the Simla Hills.
Ind. Fmg, 1944, **5**: 312-4.

A caterpillar pest of apple is described, which may defoliate 20-25% of the trees in orchards in the Simla Hills. It eluded discovery for some time owing to its habit of feeding at night only and hiding in the soil during the daytime. The life history of the pest was studied at the Punjab Agricultural College and at the Research Institute, Lyallpur, where it was identified as the larval form of *Lymantria obfuscata*. The following control measures are suggested: (1) The egg clusters, which are fairly conspicuous, being covered with yellowish brown hair, should be destroyed regularly between August and March. (2) Flat stones should be scattered on the consolidated soil around infested trees, and the scores of caterpillars which settle on the underside killed. (3) A 4-in. wide strip of oiled cloth should be tied round the stem and renewed every fortnight.

579. Coparisow, M. 632.51
A rational approach to the bracken problem.
Gdnrs' Chron., 1945, **117**: 58, bibl. 14.

A wide utilization of bracken rather than attempts at eradication is urged. The present knowledge of the fibre, carbohydrates, fungicidal properties and glucoside of bracken open new industrial possibilities for this plant. The carbohydrate content of bracken rhizomes is 13·0% (cf. potato tubers 19·7%). On heavily infested ground the weight of rhizomes may amount to 50 tons per acre, thus the possibilities of their carbohydrates for food and fermentation are obvious. The fibre in the rhizomes (6%) would become a by-product in the carbohydrate exploitation. A thick layer of cut bracken spread on the ground acts as a weed killer and is especially useful with raspberries. The immunity of bracken to fungal infection is so pronounced that the plant when used instead of straw with clamped potatoes provides protection from the infections so often fostered by the damp sodden straw. Probably bracken contains a fungicidal or fungistatic constituent, here provisionally named pteridin, and work is required to isolate and identify it and to trace any genetic, functional or chemical link between it and allantoin, lysozyme and penicillin together with its possible anti-virus and bactericidal activity. The successful use of bracken as bedding, as insecticide (cockroaches and ants), for blanching and packing seakale and as compost or mulch are all based on its fungicidal constituents. Bracken can also be used for covering rhubarb, for dyeing purposes and in the production of potash.

580. Walker, C. 632.51
Blackberry eradication.
N.Z. J. Agric., 1944, **69**: 319-20.

Blackberries were effectively destroyed by rolling down the stems with a tractor, cutting them by discing and burning the area after the shoot lengths had died out. Regrowth was controlled by crowding the land with sheep for three months. Since, after 6 years, the blackberry has not re-established itself the success may be regarded as a permanent one. Another area which had a similar treatment, excluding the grazing of sheep, was soon overrun again.

581. Marth, P. C., and Mitchell, J. W. 632.954
2,4-dichlorophenoxyacetic acid as a differential herbicide.
Bot. Gaz., 1944, **106**: 224-32, bibl. 6.

Hamner, C. L., and Tukey, H. B.
Selective herbicidal action of midsummer and fall applications of 2,4-dichlorophenoxyacetic acid.
Bot. Gaz., 1944, **106**: 232-45, bibl. 11, *J. Pap. N.Y. State agric. Exp. Stat.* **605.**

Both papers report good results from the use of 2,4-dichlorophenoxyacetic acid as a weed killer. The first account deals with experiments conducted at Beltsville, Md, where a 95% control of dandelion and narrow-leaf plantain in Kentucky bluegrass was obtained by a single spray application of a 1,000 p.p.m. solution or by two applications of a 500 p.p.m. solution, without damage to the grass. In the second instance, at Geneva, the herbicide was successfully applied against a variety of weeds at a concentration of 1,000 p.p.m. in Carbowax 1,500 at the rate of one part acid to five parts Carbowax. Aerosol methods were among those used. The action of the chemical on the weeds is described in detail and the apparent absence of a residual effect in the soil is discussed.

582. Stapel, C., and Petersen, H. L. 632.952
Tests of chemical preparations for the control of pests and diseases. [Danish.]
Tidsskr. Planteavl, 1944, **48**: 631-54, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 199-200.

The tests of proprietary spray mixtures for scab control in Denmark have been continued (see also *Tidsskr. Planteavl*, 1943, Vol. 47; *H.A.*, 14: 548). The results indicate that the standard bordeaux or lime-sulphur applications are superior to all preparations tested and that they should be used where possible without causing spray injury to the trees. Three preparations containing colloidal sulphur showed some promise and may be useful in combination with pre-blossom bordeaux or lime-sulphur applications. Further trials with the seed disinfectant Germisan, which gave good results as a substitute, should determine whether

this chemical can be regarded as a potential spray for fruit trees in normal times.

583. McCallan, S. E. A. 632.952: 635.939.516: 632.452
Evaluating fungicides by means of greenhouse snapdragon rust.
Contr. Boyce Thompson Inst., 1944, **13**: 367-83, bibl. 11.
A method is described of evaluating foliage fungicides by comparing their efficacy against *Puccinia antirrhini* in the greenhouse. The snapdragon plants are sprayed and inoculated under controlled conditions.

584. Howard, F. L., Locke, S. B., and Keil, H. L. 634.11-2.42: 632.952
Synthetic organic fungicides for apples.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 131-5.
Successful results are reported from Rhode Island from the use of two new generic groups of cationic organic fungicides, namely phenyl mercuri (Puratized) and pyridine derivatives (Isothan Q), which in two successive years controlled apple scab without foliage injury.

585. Nottini, G., and Mathlein, R. 632.96
Grönmykos förorsakad av *Metarrhizium anisopliae* (Metsch.) Sorok. I. Grönmykosen som biologiskt bekämpningsmedel. **(The fungus *Metarrhizium anisopliae* used for biological pest control.)**
Meddel. Statens Växtskyddsanstalt **43**, 1944, from *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 207-8.
A biotype of *Metarrhizium anisopliae* was found to attack and kill a variety of insect pests. Since the fungus does not depend for its existence on living insects inoculation of the soil with conidia will remain effective for a long time. Experiments on the control of certain soil fly larvae gave interesting results. In one case in 1941 cold frames were infested to such an extent that an average of 122 larvae per light were picked out by hand. Comparative tests showed that within a few days 80% of the insects were killed by a suspension of conidia as against 23% killed by arsenical and other dusts. In another trial the fungus killed 89%. Successful control is also reported from field experiments.

586. Quayle, H. J. 632.951: 632.6/7
The increase in resistance in insects to insecticides.
Calif. Citrogr., 1945, **30**: 98, 103.
The increasing resistance is discussed of various scales to HCN fumigation, of codling moth larvae to arsenical and other sprays, of the larvae of the primary screw worm to phenothiazine and of citrus thrips to tartar-emetic-sucrose spray. It is pointed out that the species represent four different orders of insects of widely different food habits and that increased resistance is shown to contact and stomach sprays, soil fumigants, a bait spray and a treatment where the insecticide is incorporated in the medium in which the insect lives.

587. Singh, M. 632.944
Fumigation and heat sterilization of insect pests.
Ind. Fmg, 1944, **5**: 111-7.
Instructions are given for the control of insect pests by fumigation and heat sterilization under Indian conditions, dealing with ordinary fumigation and vacuum fumigation chambers, fumigation tests, dosage and use of such fumigants as hydrocyanic acid gas, carbon bisulphide, and ethylene dichloride and heat sterilization with electricity and steam.

588. Stöckli, A. 632.651.3: 632.951
Die Wirkung von Gesapon auf die freilebenden Bodennematoden. **(The effect of Gesapon on free-living soil nematodes.)** [French summary 1 p.]
Landw. Jb. Schweiz, 1944, **58**: 496-506.
Gesapon, like D.D.T. another Geigy product, has been advertised as a protectant against root pests. It was the aim of the present investigation to study the effect of the chemical on the biologically important free-living nematodes. The results of carefully planned experiments show clearly that these beneficial organisms are not adversely affected by a 1-2% Gesapon solution, on the contrary they increase in compost soil as a result of the treatment. It was proved that the increase in the nematode population was not due to migration from adjacent areas produced by attraction, but to genuine multiplication. The effect of Gesapon on Azotobacter and on such soil bacteria as grow in ordinary nutrient agar was also examined. No significant changes were observed.

589. Taylor, E. L. 632.951: 632.654.2
Acaricidal property of a new insecticide, hexachlorobenzene.
Nature, 1945, **155**: 393-4.
A new insecticide, produced by I.C.I., of the general formula $C_6H_6Cl_6$ and temporarily designated 666, is reported on preliminary trials to be at least as promising as D.D.T. The study carried out by the author at the Veterinary Laboratory, Weybridge, was not made with reference to plant pests.

590. Petch, C. E. 634.1/7-2.95
Spraying materials and how to mix them.
A.R. Quebec pomol. Fruitgr. Soc. 1942, 1943, pp. 30-2.
Spraying programme and instructions for Quebec orchards with special reference to the use of cryolite. Pests requiring special sprays are the fruit tree leaf roller and the budmoth. A combination spray which will deal with both pests is recommended, namely, blood albumen 4 oz., lubricating oil 4 gal., Elgetol ½ gal., water 96 gal.

591. Petch, C. E. 634.1/7-2.95
The history of spraying and spray materials in Quebec during the past fifty years.
A.R. Quebec pomol. Fruitgr. Soc. 1943, 1944, pp. 33-45.
Spraying as an orchard practice was not prevalent in Quebec till after 1910 and it received its real impetus from the high prices received for fruit during World War 1 and the subsequent planting of new orchards. Experimental plots for spraying were in use in Quebec in 1890, but the Dominion Entomological Laboratory at Covey Hill (later at Hemmingford) was not established till 1912 and then only after prolonged agitation by the growers. The first spray calendar was prepared by Macoun and issued in 1909. Lime-sulphur was there recommended for the first time for apple scab and paste lead arsenate as an insecticide. The calendar lasted till 1921 when it was revised and since 1928 it has been published almost annually and in a simplified form. Dusting had a boom in 1916 but declined rapidly in favour, because neither the materials nor the machines were sufficiently developed. The few spray materials available in the early years gave good control but the lack of suitable sprayers was a tremendous handicap. In 1919 the purchase of power sprayers was greatly stimulated by a government grant of 25% of the cost up to a price of 500 dollars. Spray injury has been under discussion for the last 50 years and an intermittent controversy has concerned the spraying of trees in full bloom with reference to pistil injury and the poisoning of bees. Brought also into review are the insect and disease problems of the last 50 years and the various chemicals employed in dealing with them. In 1894 the growers aimed at 75% of clean fruit through spraying. They expect a higher percentage now.

592. Heimpel, L. G. 634.1/7-2.95
Spraying equipment, old and new.
A.R. Quebec pomol. Fruitgr. Soc. 1943, 1944, pp. 18-23.
An outline of the development of orchard spraying equipment from the days of hand pumps to the present

power machines and of the special problems which have had to be solved.

593. Oberle, G. D., and others. 634.11-2.951.8
Some physiological responses of deciduous fruit trees to petroleum oil sprays.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 119-30, bibl. 9.

Trials were made in 1942 and 1943 by the staff of the New York Station, Geneva, of the effect of various petroleum sprays on a number of apple varieties. Results are summarized as follows: The application of dormant petroleum oil sprays of varying oil content on apple trees was found to retard development of the new growth. The respiratory activity of the treated tissue was found to be less than that of untreated trees and was associated with increasing oil content of the sprays. The addition of a dinitro material to the oil spray also retarded development but produced pronounced increases in the rate of respiration of the trees immediately after spraying. Sprays of an acid nature which carry the dinitro material predominantly in the oil phase of the emulsion were found to be more toxic to the plant tissue than neutral or alkaline sprays. The effect of the dinitro sprays was found to be of short duration since this material is readily removed by rainfall. Histological studies of sprayed material showed that the oil does not penetrate the plant tissue extensively except at the nodes during the period when retardation effects are most evident. The lateral buds and adjacent tissues of trees receiving oil sprays of recommended maximum concentrations contained large quantities of oil which undoubtedly were responsible for the retarded development and decreased respiration noted. [Authors' summary.]

594. Lewis, F. H. 634.11-2.952
Effect of spray injury on pre-harvest drop of McIntosh apples.
Phytopathology, 1944, **34**: 1015-9, bibl. 4.

In a spraying experiment in Wayne County, New York, the amount of visible leaf injury and pre-harvest drop of McIntosh apple showed a highly significant correlation. Both were greatest on trees sprayed with lime-sulphur, lead arsenate and lime in the cover sprays. When in July and August flotation sulphur replaced lime-sulphur in the lead arsenate and lime sprays, there was less leaf injury and less fruit drop. It is suggested that excessive drop of uninjured fruits can be explained on the basis of the amount of visible leaf injury, the time of injury and the effect of sprays on leaf efficacy.

595. Loustalot, A. J. 634.521: 632.95: 581.11/13
Apparent photosynthesis and transpiration of pecan leaves treated with bordeaux mixture and lead arsenate.
J. agric. Res., 1944, **68**: 11-9, bibl. 13.

Neither bordeaux nor lead arsenate spray applications were found to depress photosynthesis or transpiration in pecan leaves.

596. American Phytopathological Society. 634/5: 632.3/4 +632.8/9
Abstracts of papers presented at the first annual meeting of the Potomac Division, Beltsville, Md, Febr. 23-24, 1944.
Phytopathology, 1944, **34**: 990-6.

The abstracts mentioned below contain points of horticultural interest. In addition, five papers presented at a special plant quarantine session emphasize the necessity of protecting crops in the U.S.A. from the introduction of new pests and diseases carried by imported plants and discuss quarantine measures.

Brierley, P., and Smith, F. F.
Some virus diseases of alliums.

Cox, C. E.
The response of cantaloup cucumber grafts to inoculation with *Fusarium bulbigenum* var. *niveum* f.2.

Demaree, J. B., and Jeffers, W. F.
***Phytophthora fragariae* Hickman and methods of testing strawberry plants for resistance.**

Goldsworthy, M. C.
The fungicidal and phytotoxic behaviour of some selected and organic and inorganic copper compounds as related to weathering.

Heuberger, J. W.
Virus disease on the California Wonder pepper in Delaware in 1943.

Jenkins, A. E.
Oedema of cultivated violet identified as scab.

Walker, E. A., and McInroy, S. W.
Tobacco anthracnose, a new tobacco plant bed and field disease.

597. American Phytopathological Society. 634/5: 632.3/4 +632.8
Abstracts of papers presented to the 27th annual meeting of the Pacific Division, Oregon State College, Corvallis, June 26 to 28, 1944.
Phytopathology, 1944, **34**: 933-7.

Among the abstracts of 19 papers presented to the meeting the following in particular concern points of interest to horticulturists.

Ark, P. A.
Further evidence of pollen dissemination of walnut blight.

Braun, A. J.
***Phytophthora* root rot of guayule.**

Cochran, L. C.
The " complex concept " of the peach mosaic and certain other stone fruit viruses.

Cochran, L. C., and Rue, J. L.
Some host-tissue relationships of the peach mosaic virus.

Gould, C. J.
Vegetable seed-treatment trials in Western Washington in 1944.

McWhorter, F. P., and Miller, P. W.
The application of vapor heat as a practical means of disinfecting seeds.

Milbrath, J. A.
Studies on the control of bean rust.

Miller, P. W., and McWhorter, F. P.
A disease of cabbage in Western Oregon due to *Cercosporella albomaculans*.

Schneider, H.
***Verticillium* wilt of guayule.**

Yarwood, C. E.
Copper sulphate as an eradicant spray.

Yarwood, C. E.
Observations on the overwintering of powdery mildews.

Zeller, S. M., Milbrath, J. A., and Cordy, C. B.
Albino cherry, a virus disease in Southern Oregon.

598. American Phytopathological Society. 634/635: 632.3/4 +632.8/9
Abstracts of papers accepted for presentation at the 36th annual meeting of the Society, Cincinnati, Ohio, December 9-11, 1944.
Phytopathology, 1944, **34**: 997-1014.

Eighty papers are abstracted including the following of interest to horticulturists.

Barratt, R. W., and Richards, M. C.
Physiological maturity in relation to *Alternaria* blight in the tomato.

CALAVAN, E. C.
The use of eradicant and blossom sprays on sour cherry in the control of brown-rot blossom and spur blight incited by *Sclerotinia laxa* Ader. and Ruhl.

CHAMBERLAIN, D. W.
Chemical treatments in tobacco seedbeds.

DIMOCK, A. W.
Soil treatment with sodium selenate for control of foliar nematode of chrysanthemums.

FOSTER, H. H., AND PINCKARD, J. A.
Control of cabbage mildew by means of benzene vapor.

FOSTER, R. E.
Predisposition of tomato plants to *Fusarium* wilt.

FRAMPTON, V. L., AND TAKAHASHI, W. N.
Electrophoretic studies with the plant viruses.

FRAZIER, N. W.
Phylogenetic relationship of the nine known leafhopper vectors of Pierce's disease of grape.

GROVES, A. B.
Soil treatments and apple replant survival in *Xylaria mali*-infested locations.

GROVES, A. B.
Compatibility of organic fungicides and summer oil.

HAMILTON, J. M., PALMITER, D. H., AND MACK, G. L.
Tests with new organic fungicides on orchard fruits.

HEUBERGER, J. W., AND WOLFENBARGER, D. O.
Zinc dimethyl dithiocarbamate and the control of early blight and anthracnose on tomatoes and of leaf hoppers and early blight on potatoes.

HILDEBRAND, E. M.
The cherry virus complex in New York.

HILDEBRANDT, A. C., RIKER, A. J., AND DUGGAR, B. M.
Effect of crown-gall bacterial metabolites, crown-gall tissue extracts, and the composition of the medium on growth in vitro of excised tobacco and sunflower tissue.

HORSFALL, J. G., AND ZENTMYER, G. A.
Fungicidal action of reagents for amino acids, amines, aldehydes and other reactive cell constituents.

HOWARD, F. L., KEIL, H. L., AND MOSHER, H. H.
Derivatives of pyridine and quinoline as cationic fungicides.

HOWARD, F. L., AND OTHERS.
Nicotinium derivatives as fungicides.

JOHNSON, J.
Water influencing host-predisposition.

JOHNSON, J.
Bacterial invasion through stomata.

KEITT, G. W.
A spray boom adapted for ground-spraying to combat apple scab.

KENDRICK, J. B.
Fruit invasion and seed carriage of tomato *Fusarium* wilt.

KENDRICK, J. B.
Rhizopus stem blight of tomato.

KUNKEL, L. O.
Transmission of virus from X-diseased peach trees to herbaceous plants.

LEACH, L. D., AND SNYDER, W. C.
Effectiveness of seed treatments against surface-borne ascochyta on pea seeds.

LOCKE, S. B.
An isoquinolinium fungicide for apple scab control.

MACK, G. L., HAMILTON, J. M., AND AVENS, A. W.
Deposition of fungicides and insecticides on cherry foliage.

MAGIE, R. O.
Hop twine treatment in controlling downy mildew.

MCCALLAN, S. E. A.
Evaluating fungicides by means of greenhouse snapdragon rust.

MILLER, H. J.
The use of *Venturia inaequalis* and *Sclerotinia fructicola* with pure chemical stimulants in slide-germination tests of fungicides.

MOORE, J. D.
High calcium vs. high magnesium lime in the preparation of bordeaux mixture for cherry leaf-spot control in Wisconsin.

MOORE, J. D., AND KEITT, G. W.
Host range studies of necrotic ring spot and yellows of sour cherry.

NAGEL, C. M.
A new organic fungicide, 2, 3-dichloro-1, 4-naphthoquinone: its value as a control for certain defoliation diseases of the tomato.

OU, S. H.
Anthracnose of garden pea.

SCHUSTER, M. L., AND ANDERSON, E. J.
Seedling blight and root rot of flax in Washington.

SHAY, J. R.
Preliminary results on the effectiveness of Elgetol as an eradicant in grape blackrot control.

STODDARD, E. M.
Immunization of peach trees to X disease by chemotherapy.

WALKER, J. C.
Progress in combination of yellows and mosaic resistance with high ascorbic acid content in cabbage.

WATSON, R. D., AND NIKITIN, A. A.
A new dust with adherence.

WELLMAN, R. H., AND MCCALLAN, S. E. A.
A greenhouse weathering technique for predicting field performance of fungicides.

WILSON, J. D.
The zinc salt of dimethyl dithiocarbamic acid (Methasan and Zincate) as a fungicide on vegetables.

WILSON, J. D., AND RUNNELS, H. A.
Summary of results obtained in a 10-State experiment on the control of tomato anthracnose.

WINTER, H. F., AND YOUNG, H. C.
Puratized N5D, Fermate and Methasan for the control of apple scab and bitter rot.

599. APPEL, O. 632.95
(17) Handbuch der Pflanzenkrankheiten. Band VI. Pflanzenschutz, Verhütung und Bekämpfung der Pflanzenkrankheiten. **(A manual of plant diseases. Vol. VI. Plant protection, prevention and control.)**
P. Parey, Berlin, 1941, 5. Lief. Halbbd. II, pp. 401-732, RM. 20.60, from review *Zbl. Bakt.* IIte Abt., 1942, **105**: 257-9.

BREDENKAMP, J. 632.951
Zur Kenntnis der Wirkungsweise der Kontaktgifte mit besonderer Berücksichtigung der Permeabilität der Insektencuticula. **(The action of contact poisons, with special reference to the permeability of insect cuticle.)**
Z. angew. Ent., 1941, **28**: 519-49, from abstract *Zbl. Bakt.* IIte Abt., 1942, **105**: 295-6.

HOBBS, C. L. 634.975: 632.19
Studies of mineral deficiency in pine [*Pinus* spp.].
Plant Physiol., 1944, **19**: 590-602, bibl. 13.

KUENEN, D. J. 632.654.2+632.753
Onderzoek naar den invloed van vruchtboom-carbolineum en aardolie-emulsie op de eieren van appelbladluis en spint. Verslag van de werkzaamheden in den winter 1940-1941. **(Investigation on the effect of fruit tree carbolineum and petroleum emulsion on the eggs of aphis and red spider. Report for the winter of 1940-1941.)**
Mimeographed, 1941, pp. 21, bibl. 14.
Work under the direction of Zeeland's Proeftuin, Goes.

MARSH, P. B. 632.4: 632.952
Salts as antidotes to copper in its toxicity to the conidia of *Sclerotinia fructicola*.
Phytopathology, 1945, **35**: 54-61, bibl. 5.

MEDLER, J. T. 632.653(776)
The leafhoppers of Minnesota. (*Homoptera*: *Cicadellidae*.)
Tech. Bull. Minn. agric. Exp. Stat. **155**, 1942, pp. 196, bibl. 140.

PALMITER, D. H. 634.11-2.951
Relation of spray materials to russeting of Delicious and Golden Delicious apples.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 113-8, bibl. 3.

RHOADS, A. S. 632.44: 635.976
***Clitocybe* mushroom root rot of woody plants.**
Pr. Bull. Fla agric. Exp. Stat. **538**, 1939, pp. 2.

RUDORF, W. 631.521.6
Resistenzzüchtung, ihre Grundlagen und Methoden. **(The principles and methods of plant breeding for resistance.)**
Z. Pflanzenzüchtg, 1943, **25**: 190-208, from abstract *Gartenbauwiss.*, 1944, Vol. **18**, abstr. pp. 56-7.

SCHULTZ, H. 632.4
Arbeitsmethoden bei Kultur- und Infektionsversuchen mit *Pythium*-Arten. **(Methods for culture and inoculation experiments with *Pythium* species.)**
Zbl. Bakt., IIte Abt., 1942, **105**: 248-54, bibl. 5.

STELLWAAG, F. 634.8-2.78
Die Eientwicklung der Traubenwickler *Polychrosis botrana* Schiff. und *Clysia ambiguella* Hübn. unter Freilandbedingungen. **(The development of the egg in the grape pests *Polychrosis botrana* and *Clysia ambiguella* under field conditions.)**
Anz. Schädlingskde, 1943, **19**: 25-30, 41-7, from abstract *Gartenbauwiss.*, 1944, Vol. **18**, abstr. pp. 62-3.

TOOKE, F. G. C., AND SCOTT, M. H. 632.76: 634.928.4
Wood-boring beetles in S. Africa. Preventive and remedial measures.
Bull. Dep. Agric. S. Africa **247**, (*Ent. Ser.* **14**), 1944, pp. 37, 6d.

WATSON, J. R. 634.58-2.6/7
Peanut insects and other enemies.
Pr. Bull. Fla agric. Exp. Stat. **585**, 1943, pp. 4.

WATSON, J. R. 632.693.2
Moles.
Pr. Bull. Fla agric. Exp. Stat. **607**, 1945, pp. 2.

WEBER, G. F. 632.44
Thread blight of woody plants [*Corticium stevensii*].
Pr. Bull. Fla agric. Exp. Stat. **551**, 1940, pp. 2.

WILLISON, R. S. 634.22-2.8
Strains of prune dwarf.
Phytopathology, 1944, **34**: 1037-49, bibl. 14.

ZENTMYER, G. A., WALLACE, P. P., AND HORSFALL, J. G. 632.48: 634.972.8
Distance as a dosage factor in the spread of Dutch elm disease.
Phytopathology, 1944, **34**: 1025-33, bibl. 10.

VEGETABLE, RUBBER, TOBACCO AND OTHER PLANTS.

600. HANSEN, L., JUNGGREEN HAVE, F., AND KLOUGART, A. 635.1/7
Twenty-fourth report on vegetable variety trials. [Danish.]
Aarb. Gart. Kbh., 1944, **25**: 190-237, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 181-2.

Brussels sprouts: Three Danish varieties with heights of 53-58 cm., 40-42 cm. and 43-49 cm. are recommended for harvest in early winter, midwinter and spring as a result of 3 years' trials. During the mild winter of 1942-43 yields were affected by attacks of *Sclerotinia sclerotiorum* and *Botrytis* spp. The early variety was more susceptible both to the fungi and the cold than the later varieties. *Celeriac*: Among the varieties recommended is Balder, which was produced at the Research Station, Blangstedgaard, from a cross between Prague Giant and Alabaster. This variety was found to be resistant to leaf-spot (*Septoria apii*). The whole crop was severely infested with carrot fly which showed great preference for celeriac. Trials with parsley and spinach varieties are also reported.

601. LENANDER, S. E. 635.1/7
Resultat från sortförsök med köksväxter från Rånna försöksstation 1938-41. **(Results from vegetable variety trials at the Rånna Research Station, 1938-41.)**
Meddel. Stat. Trädgårdsförs. **25**, 1944, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 182-4.

The Research Station Rånna near Skövde is situated on a north slope 200 m. above sea level and is representative of the ground and soil conditions prevailing on the slopes of Western Götaberg. For the extensive trials conducted in 1938-41 vegetable varieties, early and late, were selected which had proved particularly successful at Alnarp. The tests, in many cases replicated on different soils, included the more commonly grown kinds of vegetables. The chief results are noted.

602. EĬHFELJD [EICHFELD], I. G. 635.1/7: 632.111
The establishment of food centres in the far north. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, No. 1, pp. 3-8.

Even in the region of the Arctic Circle vegetables have been successfully grown. The clear atmosphere, the long periods of daylight—the quality of the light having a large proportion of the orange band of the spectrum—and a temperature in spring which favours vernalization have all enabled solar conditions to be fully utilized. Furthermore, northern latitudes influence the genetical properties of the crop plants brought from the south in such a way as to render them adaptable to the unfamiliar conditions and pliable material in the hands of the plant-breeder, even in regard to characters hitherto firmly established. Advantage is being taken of this to breed varieties which mature rapidly and withstand low temperatures during the Arctic growing season. Arctic agriculture can be facilitated not only by breeding new varieties of crop plants, artificial vernalization and other methods of treating seed before sowing it, but also by getting rid of the snow lying on the ground in spring by means of water or in other ways and so enabling cultivation

to begin early. The quality of Arctic soils in no way hinders plant growth; even the mineral soils yield well if manured with peat combined with dung. Vegetables have been successfully grown also under glass. The following yields of vegetable crops per hectare are claimed to have been obtained in various parts of the Arctic: cabbages up to 500 centners,* potatoes up to 310 centn., carrots 300 centn., and cucumbers 6 to 9 kg. per square metre under glass. Tomatoes have been grown in the open, yielding 30% of red fruit.

603. (Kent War Agricultural Committee.) 635.1/7
Market gardening problems [in England].
Fruitgrower, 1945, **99**: 152, 156, 171-2, 175-7.

Summaries are given of the following papers read at a conference held at Maidstone on 22 February. The use of straw and straw composts, by Dr. A. H. Bunting; the manuring of vegetable crops by Professor T. Wallace; eelworm disease of onions by Dr. T. Goodey; the future outlook of the vegetable growing industry by Mr. D. Lowe. Dr. Bunting made out a strong case for the use of composted straw in market gardening as an alternative to ploughing in, but he did not think it practicable under farming conditions. He explained the character and composition of straw. On the plant nutrition side straw had very little contribution to make, but strong reasons for returning it to the soil were to be found in the organic matter of which it was composed and its direct physical reaction on the soil. In ploughed-in straw the importance of nitrogen in the rotting down process is great. One cwt. of sulphate of ammonia per ton of straw has been found useful. Turning to composting straw he said there were three main conditions, namely enough nitrogen to rot down the cellulose, enough water to assist the bacteria and adequate air. Mr. J. Foat gave an interesting account of his method of composting layers of tomato bine, including the roots, straw and a small layer of pig manure with ammonia and lime added. This compost has proved very successful applied to the succeeding crop, usually onions, on the land which had previously grown the tomatoes. Dr. Wallace said that certain basic conditions for fertility in market garden crops included depth of soil and free drainage; the soil must have a big capacity for holding water but not free water. Good aeration was also necessary and freedom from acidity but not an excessive alkalinity. There should be plenty of organic matter, some of it in an active state of decomposition. Mineral nutrients were necessary but must not be overdone. The occasional use of magnesium limestone was beneficial because magnesium deficiency was often a serious problem. The best place for lime was before a green crop. He gave points on manuring for a large number of vegetables. Mr. E. Vinson advocated trimming cauliflowers and broccoli in the field and returning the stems and leaves to the soil. These crops gave a better return than cabbages and, treated as he suggested, left a lot in the soil. Dr. T. Goodey said onion bloat or eelworm had been known since 1883 and during the present war years had increased enormously. He explained how he had found the eelworm in the flower-heads, and had discovered that it travelled up from the bulb and infested the seed. The progress of the eelworm up the stem was shown photographically. The occurrence of the parasite on seed helped to explain the sporadic outbursts all over the country. He found that the parasite could be killed by fumigation with methyl bromide and hoped in a few months to have apparatus designed which would fumigate 1 cwt. of seed at a time. Mr. David Lowe thought that fresh vegetable growers had nothing to fear from canning or dehydration but the quick-freeze system might one day affect growers seriously by enabling produce to be stored fresh and released in time to compete in the early or late markets which are the objective of most growers. The speaker, who is experienced in French intensive gardening, gave some details of its possibilities and requirements. British gardens could compete with foreign imports provided the prices were maintained at a reasonable level.

* 1 centner per hectare = 89 lb. per acre.

604. Anon. 635.1/7(73)
Production and consumption of vegetables in the United States.
Fruit Prod. J., 1945, **24**: 163-4.

From a survey of the Bureau of Agricultural Economics of the U.S. Department of Agriculture figures are quoted for the production of frozen, dehydrated and canned vegetables during recent years and for vegetable consumption during the period 1909-43.

605. Secrett, F. A. 635.1/7: 631.67
Horticultural irrigation system for market gardens.
Fruitgrower, 1945, **99**: 131-2, 138.

The report forms part of a paper read before the Institution of British Agricultural Engineers, 28 March, 1944. The many advantages of irrigation for market garden crops are outlined. The range of crops can be increased considerably. In the east of England there is little land that will grow summer cauliflowers without artificial watering. The efficient use of artificial rain will double the output of a holding even in normal seasons. Many growers depend on careful timing to catch certain markets lasting only a week or two, and this cannot be achieved without an irrigation plant. Total dependence on a water company is not advisable; some auxiliary or alternative supply under the grower's own control should be found. Various suggestions as to this are made and design and equipment of the pumping plant, mains, and spraying lines are discussed. The author prefers overground mains supported on concrete dollies 2 ft. above the ground. The injection of saturated solutions of nutrients or insecticides into the mains is possible and practised by the author, who uses nutrients in the proportion of 1 in 20,000 to 1 in 30,000. A method of increasing the oxygen supply in the water is described. Nine general principles for the successful use of irrigation on market garden crops are laid down.

606. Porter, R. H. 631.531: 633/635
Testing the quality of seeds for farm and garden.
Res. Bull. Ia agric. Exp. Stat. **334**, 1944, pp. 495-586, bibl. 54.

In this comprehensive survey approximately 200 seeds, agricultural, horticultural, and weeds, are illustrated by photos, and drawings are presented of a number of young seedlings. The subject is thoroughly dealt with under the following headings:—Definitions (purity of seed, seed viability, etc.); factors affecting seed quality; sampling, packaging and mailing of seed; methods employed to determine seed quality; germination tests; pathological tests; interpretation of tests; determination of moisture in seeds; variation in seed samples; seed laws.

607. Thornton, N. C. 631.531.16
Carbon dioxide storage. XII. Germination of seeds in the presence of carbon dioxide.
Contr. Boyce Thompson Inst., 1944, **13**: 355-60, bibl. 7.

The tabulated data show the effect of various CO_2 concentrations on germination of seeds and seedling growth at temperatures ranging from 5° to 35° C. Among horticultural seeds cabbage, onion, pepper, pea, radish, sunflower and tomato were found to be less susceptible to high concentrations of CO_2 than most seeds. With the exception of the lower and to a certain extent of the highest temperatures, when resistance was reduced, and in the presence of a normal oxygen supply a concentration of 40-80% CO_2 was generally required to inhibit germination. With cabbage, pea and sunflower, germination was initiated at all concentrations.

608. KEDROV-ZIHMAN, O. K., AND KEDROVA-ZIHMAN, O. E. 546.27: 635.1/7: 631.531
The effect of boron on the size and quality of the yield of vegetable seeds. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1943, No. 3, pp. 34-7, bibl. 9.

Pot experiments were carried out in 1942 at the Siberian Research Institute of Cereal Crops, with (1) table beet, (2) carrots, (3) radishes and (4) beans. The soil (5·5 kg. in each pot) contained N, P, K, Ca, Mg and organic fertilizer; 0·048 g. B, in the form of K_3BO_3, was given per pot and in another variant with table beet 0·096 g. H_3BO_3. There were suitable controls. The experimental plants of (1) gave in the field a 41% better seed production than the controls; doubling the dose of boron had no appreciable effect. The germinating capacity of the seeds of experimental plants was greater than that of controls, and shoots appeared 2 days earlier than in the case of controls. Similarly the average increase in the yield of seeds by comparison with controls in (2), (3) and (4) was 33, 30 and 20% respectively.

609. OGILVIE, L. 635.1/7: 632.1 + 632.3/4 + 632.8
Diseases of vegetables.
Bull. Minist. Agric. Lond. **123** (2nd edition), 1944, pp. 74, 1s. 6d.

The second edition of this growers' bulletin follows the lines of the first (see *H.A.*, 1941, 11: 1210), but many new items of information are included on disease phenomena, on control methods and particularly on deficiency symptoms. In addition to the illustrations previously given, new photographs are shown of the incidence of downy mildew on cauliflower seedling, white blister of brassicas, neck rot of onion, chocolate spot on broad bean, damping off on lettuce and of tomato foot rot, streak and blight.

610. DOYER, L. C. 632.4: 631.531
De beteekenis van het zaad als overbrenger van ziekten en plagen in groentegewassen. **(Seed transmission of diseases and pests.)**
Tijdschr. PlZiekt., 1941, **47**: 14-24, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 76-7.

The seed transmission of the following diseases, among others, are discussed and notes are given on their significance and control: *Ascochyta pisi* and *Micosphaerella pinodes* in peas, *Colletotrichum lindemuthianum* and *Macrosporium commune* in beans, *Colletotrichum spinaciae*, *Peronospora spinaciae*, *Phoma* and *Fusarium* in spinach, *Botrytis allii* and *Macrosporium parasiticum* in onions, *Septoria apii* in celery and *S. petroselini* in parsley and different *Alternaria* species in cabbage. Certain seed beetles are also dealt with.

611. WATSON, J. R., AND TISSOT, A. N. 635.1/7: 632.6/7
Insects and other pests of Florida vegetables.
Bull. Fla agric. Exp. Stat. **370**, 1942, pp. 118.

In this comprehensive, well illustrated bulletin Florida vegetable pests and their control are treated under the heading of the crop damaged. In addition sections are devoted to direct and indirect methods of pest control, and to such general garden pests as grasshoppers, mole-crickets, etc.

612. JAARSVELD, A. 632.4: 632.96
Der Einfluss verschiedener Bodenpilze auf die Virulenz von *Rhizoctonia solani* Kühn. **(The effect of different soil fungi on the virulence of *R. solani*.)**
Phytopath. Z., 1942, **14**: 1-75, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 78.

The following soil fungi were found to exert an antagonistic effect on *Rhizoctonia solani*:—*Absidia spinosa*, *Cladosporium herbarum*, *Cylindrocarpum didymum*, *Penicillium expansum*, *Pyronema confluens* and two strains of *Trichoderma lignorum*, seedlings of *Brassica chinensis* serving as test plants. When several antagonistic fungi were added the total effect was greater than in the case of one antagonist only, with the exception of *Cylindrocarpum*, which reduced the antagonistic action of other fungi present. The effective agent was not confined to living fungi.

613. SOHI, G. S. 635.1/7: 632.6/7
Insect pests of vegetables in the Punjab and their control.
Punjab Fruit J., 1944, **8**: 87-94.

The information available on the following insect pests of vegetables in the Punjab and on their control is separately presented: Red pumpkin beetle (*Aulacophora foveicollis*), solanaceous hadda (*Epilachna dodecastigma*), cucurbit hadda (*E. dumerili*), kadu bug (*Aspongopus janus*), brinjal lace wing bug (*Urentis sentis*), brinjal fruit borer (*Lacinodes orbonalis*), brinjal stem borer (*Euzophera perticella*), spotted boll worm (*Earias fabia*, *E. insulana*), tomato borer (*Heliothis obsoleta*), potato tuber moth (*Gnorimoschema operculella*), white fly (*Bemisia tabaci*), jassid (leaf hopper, *Empoasca devastans*), vegetable mite (*Tetranychus cucurbitae*), cabbage butterfly (*Pieris brassicae*), diamond back moth (*Plutella maculipennis*), cabbage aphis (*Siphocoryne indobrassica*), painted bug (*Bagrada picta*), green potato bug (*Nezara viridula*), onion thrips (*Thrips tabaci*), pea thrips (*Thrips indicus*), mustard sawfly (*Athalia proxima*).

614. JACKS, H. 632.651.3: 632.944
Soil disinfection. I. Preliminary report on control of eelworm.
N.Z. J. Sci. Tech., 1944, **26**, Sec. A, pp. 186-9, bibl. 2.

Of a number of soil treatments for nematode control by the Plant Research Bureau, D.S.I.R., N.Z., chloropicrin, D-D and formalin are worth further investigation. Silver proteinite, calcium chloracetate and naphthalene were ineffective. The value of carbon disulphide is doubtful. D-D and cresylic acid caused some root injury. The treatments were made in infested soil in boxes 18 in. × 12 in. × 5 in. and the indicator plants were tomatoes.

615. BHALERAO, G. D. 632.651.3
Plant nematodes, a neglected subject in India.
Curr. Sci., 1944, **13**: 301-2, bibl. 4.

Indian scientists are urged to take up the investigation of plant nematodes. Among the number of nematodes suggested for closer study the following attack horticultural and plantation crops in India:—*Anguillulina dipsaci*, *A. similis*, *A. pratensis*, *Tylenchulus semipenetrans*, *Heterodera schachtii*, *H. marioni*, *Aphelenchoides fragariae* and *A. cocophilus*.

616. HORNSEY, W. H. 631.462
A high-pressure steam sterilizing plant.
Gdnrs' Chron., 1945, **117**: 56.

Description of a plant for steam sterilizing potting soil. Two men can sterilize 36 to 40 wheelbarrow loads of soil in 8 hours. The temperature reaches 210°F. in 8 minutes; the pressure is not less than 40 and not more than 80 lb. per square inch.

617. ROBINSON, R. R. 631.462
Inhibitory plant growth factors in partially sterilized soils.
J. Amer. Soc. Agron., 1944, **36**: 726-39, bibl. 18.

The deleterious effect of steam sterilization (2 hours at 5 lb. pressure) or incubation (50° C. for a few days) of certain soils on plant growth appears to be due to a toxic concentration of some substance which has not been identified. The inhibitory effect was counteracted by a heavy application of phosphate; before or after sterilization, although phosphate deficiency as a result of phosphate fixation could hardly be regarded as the cause of the trouble. The inoculation of sterilized soil with untreated soil was found to shorten the period of growth inhibition. Of the test plants employed Ladino and red clover proved very susceptible, while tomato showed intermediate sensitiveness.

618. DE MENEZES, O. B. 633.37
Estudos para o melhoramento do guando—espaçamento e competição de variedades. **(Spacing experiments with pigeon pea.)** [English summary 2 pp.]
Rev. Agric. S. Paulo, 1944, **19**: 399-412, bibl. 8.
Red-, yellow-, spotted- and black-seeded varieties of pigeon pea were used in a spacing experiment. Red- and black-seeded varieties proved inferior. For the others spacing at 2 m.×1 m. and 1 m.×1 m. gave higher yields than 2 m.×2 m., especially with the spotted variety, which was the best. The results seem to be of less interest than the manner of arriving at them, much of the paper being taken up with statistical computations.

619. PAL, B. P., AND DESHMUKH, M. J. 633.491-1.532.2
Potato "tops" and "eyes" as seed.
Curr. Sci., 1944, **13**: 309-11, bibl. 4.
The possibility of utilizing potato "tops" and peelings as seed under the conditions of the North Indian plains was studied at the Imperial Agricultural Research Institute, New Delhi. The yields of plants raised from tops of the Phulwa variety were not unsatisfactory. Further trials are in progress to find out whether yields can be improved by closer spacing accompanied by suitable manuring.

620. GLUŠČENKO, I. 633.491-1.532.2
Using potato crowns for propagation in Kirgizia. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, Nos. 2-3, pp. 30-5.
The general conclusion is that propagation by means of potato crowns cut in autumn from large tubers and stored in earth is at least as successful as propagation by means of whole tubers. The conditions necessary for obtaining the requisite corky layer on the cut pieces are a temperature of 15° to 18° C. and adequate aeration and moisture during the first 10 to 15 days after cutting.

621. WHEELER, E. J., STEVENSON, F. J., AND MOORE, H. C. 633.491-2.3/4
The Menominee potato: a new variety resistant to common scab and late blight.
Amer. Potato J., 1944, **21**: 305-11.
This new variety is moderately resistant to late blight (*Phytophthora infestans*), but is chiefly important by reason of its resistance to scab (*Actinomyces scabies*). Its yield is generally satisfactory.

622. ŠENDERECKII, E. 633.5: 632.111
Experiments in extending the cultivation of fibre crops northwards. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, No. 1, pp. 13-9.
Attempts have been made, largely successful, to grow Italian hemp (*Cannabis sativa*), jute, *Hibiscus cannabinus* and *Abutilon avicennae* in regions more northerly than those in which they have hitherto been grown in the U.S.S.R., and yields have sometimes been 3 or 4 times larger than in the south. The crops were grown in Saratov, Kŭibyšev, and Alma Ata where stems and fibre, but not always seed, were produced. *H. cannabinus* was the most sensitive to cold of all the four crops grown; and its initial growth was very slow. Jute was also sensitive. Italian hemp proved to be the hardiest, and yielded seed in satisfactory amounts. Its seedlings could stand —7° C. Experiments to determine the best time for sowing showed that this needs to be judged with care; if sowing is done too early in spring, frosts might destroy the seedlings, if too late, not enough time is left in which to mature the crop.

623. HADFIELD, J. W. 633.51
The linen flax industry.
N.Z. J. Agric., 1944, **69**: 401-5.
A discussion of the objectives, attainments and prospects of the New Zealand linen flax industry by the Director of the Linen Flax Development, Christchurch. It is thought that an improvement of mass production methods may lead to a permanent establishment of the industry in New Zealand, probably on a small scale.

624. MILTHORPE, F. L. 633.52-1.811.91
Fibre development of flax in relation to water supply and light intensity.
Ann. Bot. Lond., 1945, **9**: 31-53, bibl. 11.
At Sydney University flax was grown in the greenhouse from the seedling stage to maturity under four conditions of light intensity and water supply, in order to make a quantitative study of the plant and its fibre system. The shaded plants were markedly less thrifty in every respect than plants grown in full light. It is thought that their lower degree of development was not due to reduced photosynthesis but to some other effect of light. Drought under full light produced similar results to those of shade, though the lower yield of fibre was not associated with a lower percentage of fibre, as is the case under shade conditions. The effect of the various treatments on fibre anatomy and development is described in detail.

625. TIVER, N. S., AND WILLIAMS, R. F. 633.52: 633.85
Studies of the flax plant. 2. The effect of artificial drought on growth and oil production in a linseed variety.
Reprinted from *Aust. J. exp. Biol. med. Sci.*, 1943, **21**, pp. 201-9, bibl. 18.
Pot cultures of the linseed variety Punjab were subjected to artificial drought after flowering at the Waite Agricultural Research Institute. The drop in oil yield as a result of this treatment, attributed to a depression of the net assimilation rate, amounted to nearly 40%. A physiological interpretation of the results of a growth analysis is presented and the effects of drought and time of sowing on linseed and Liral Crown flax are compared.

626. RÖDER, K., AND KRÜGER, E. 633.52-1.531.17
Zur Frage der Hanf- und Leinsamenbeizung. **(The disinfection of hemp and flax seed.)**
NachrBl. dtsch. PflSchutzdienst, 1942, **22**: 9-11, from abstract *Zbl. Bakt.* IIte Abt., 1943, **105**: 430.
Hemp and flax seed were successfully disinfected by Abavit-Neu, Ceresan, Fusariol and Germisan dusts applied at the rate of 200 g. per 100 kg. of seed. Germination was increased by 6-10%, in the case of badly germinating seed the increase was higher.

627. MUSKETT, A. E., AND COLHOUN, J. 633.52-1.531.17
The prevention of seed-borne diseases of flax by seed disinfection. II. Comparison of the dusting, short wet and fixation methods of treatment.
Ann. appl. Biol., 1944, **31**: 295-300, bibl. 4.
All three methods of treating flax seed with suitable organo-mercury preparations gave good control of *Polyspora lini* and *Colletotrichum lini* and increased the yields.

628. MUSKETT, A. E., AND COLHOUN, J. 633.52-2.4
Foot rot (*Phoma* sp.) of flax.
Nature, 1945, **155**: 367-8, bibl. 7.
It is shown that the footrot disease (*Phoma* sp.) of flax may be seed borne and more generally distributed by this means than through the soil. Disinfection of seed with New Improved Ceresan at the rate of 12 oz. per cwt. has proved effective and harmless to germination in laboratory experiments by the Northern Ireland Ministry of Agriculture at Queen's University, Belfast.

629. MEDVEDEVA, G. B. 633.522
On the embryology of *Hibiscus cannabinus*. [Russian.]
J. Bot. U.R.S.S., 1944, **29**: 264-73.
The article contains a description of the pollination and the development of the embryo, and is illustrated with drawings

of microscopic sections showing the various nuclear changes and all divisions which take place.

630. Fox, D. H. 633.524.1
Sunnhemp fibre production.
Rhod. agric. J., 1945, **42**: 6-13.

As a result of an experiment on sunnhemp fibre production carried out by a number of farmers at the request of the Department of Supply it is suggested that an increase in the price of fibre by £4 per ton would make the growing of sunnhemp an attractive proposition in Rhodesia.

631. Anon. 633.524.1-2.48
A wilt disease of sunn hemp in S.A.
Fmg S. Afr., 1945, **20**: 30.

A preliminary description is given of a wilt disease of sunnhemp caused by *Fusarium moniliforme* var. *subglutinans* and apparently spreading in South Africa. The disease seems to be carried over in the soil, hence crop rotation and the use of a fungicidal dust for seedling protection recommend themselves as the obvious control measures.

632. Ergle, D. R., Robinson, B. B., and Dempsey, J. M. 633.524.3
Malvaceous bast fiber studies.
J. Amer. Soc. Agron., 1945, **37**: 113-26, bibl. 10.

Hibiscus cannabinus, *H. sabdariffa* var. *altissima* and *Urena lobata* were grown experimentally near Altmore, Ala. The results obtained appear to justify consideration of these species as a domestic source of jute-like fibre in an emergency.

633. Brown, D. D. 633.71
The culture of Turkish tobacco in Southern Rhodesia.
Rhod. agric. J., 1945, **42**: 53-75.

Turkish tobacco from Southern Rhodesia being in great demand and many new growers entering the industry, this comprehensive and illustrated article by the Chief Tobacco Officer will be welcome to many prospective producers. The subject is dealt with under the following headings: Climate, soils, rotation of crops, seed-beds, preparation of seed-beds, preparation of the land, manurial treatment, transplanting, cultivation, pruning, harvesting, stringing, curing, handling after curing, conditioning, baling.

634. Spranger, N. D. 633.71
Growing and curing flue-cured tobacco in Central Province, Kenya.
E. Afr. agric. J., 1945, **10**: 140-6.

Following successful trials the cultivation of flue-cured tobacco has become established in the Fort Hall-Embu and Kitui Districts of Central Province, Kenya, where in 1942 410 acres were devoted to the crop. The article discusses the climatic and soil conditions suitable for tobacco growing in the area and describes cultivation in the nursery and in the field, harvesting, curing, grading and packing. The most successful variety, now the only one grown, is White Stem Orinoco, seeds of which were imported from Rhodesia.

635. Moss, E. G., and Teter, N. C. 633.71-1.56
Bright leaf tobacco curing.
Bull. N. Carolina agric. Exp. Stat. **346**, 1944, pp. 25, bibl. 9.

Suggestions for improving the technique of tobacco curing and a description of the difficulties encountered in the process.

636. Amlong, H. U., and Lauche, K. 633.71: 577.15.04
Hormonisierungsversuche an Tabak. **(Hormone experiments with tobacco.)**
Pflanzenbau, 1943, **19**: 308-14, bibl. 6.

A comparison of various treatments showed that soaking tobacco seed of a poorly rooting variety for 24 hours in a solution of 50 mg./l. potassium naphthylacetate + 50 mg./l. ascorbic acid and 1,000 mg./l. thiourea increased leaf weight by 7·6% beyond that of the controls. The trials were carried out at Poznan. The results of experiments conducted by other authors at Meyenburg in the Province of Brandenburg are quoted for comparison. In this case an increase of 15% is claimed as a result of treatment with half the dosage applied at Poznan, where the more dilute solution was not tried.

637. Petrie, A. H. K., and Arthur, J. J. 633.71-1.432
Physiological ontogeny in the tobacco plant. The effect of varying water supply on the drifts in dry weight and leaf area and on various components of the leaves.
Reprinted from *Aust. J. exp. Biol. med. Sci.*, 1943, **21**: 191-200, bibl. 12.

The investigation was carried out at the Waite Research Institute. The growth curves are explicable in terms of assimilation rate on a protein basis and of protein content. It is shown that when tobacco plants are subjected to drought either permanent or temporary, compared with fully-watered plants the net assimilation rate on a protein basis is decreased and at the same time there is a greater percentage uptake of nitrogen from the soil. When plants subjected to temporary drought are returned to high-water conditions, the net assimilation rate is restored to approximately the same value as that of the control high-water plants, but with return of the high assimilation rate the protein content of the leaves becomes greater than that of the controls and the growth rate consequently becomes greater than that of the controls. In plants subjected to permanent drought, the net assimilation rate is considerably lower than that of the fully-watered plants and, since the maximum protein content of the leaves is attained later than that of the fully-watered plants, carbohydrate content may limit protein formation. The slower growth rate delays senescence with its accompanying loss of leaf protein so that during late harvests the growth rate of the low-water plants is greater than that of the controls. [Authors' conclusions.]

638. Jakovuk, A. S. 633.71-1.531
The influence of external conditions on the biology of flowering and on the ripening of tobacco seed. [Russian.]
Publ. The All-Union (Mikojan) Research Institute of the Tobacco and Mahorka Industry **143,** being a symposium on the breeding, genetics and seed production of tobacco and mahorka, 1941, pp. 248-55.

Within the range of temperatures observed, an increase of temperature facilitated pollen germination and extended the range of optimal temperatures for named tobacco varieties. A sudden lowering of the temperature immediately after fertilization hindered pollen germination. The stigma became responsive to pollen about 3 days before the flower opened out, though such early fertilization resulted in incomplete setting of seed. The period during which the stigma remained responsive was short if the days were hot and dry, but was prolonged if they were cool and humid. The weather—comprising the conditions of temperature, humidity and sunlight—was a more decisive factor in determining the length of the period in which the seeds matured than the position of the flower on the plant. Sudden variations in weather delayed maturation.

639. Čirkovskiĭ, V. I. 633.71-1.531
Methods of hastening the determination of germination in the seeds of ordinary tobacco and *N. rustica* [Russian.]
Pub. The All-Union (Mikojan) Research Institute of the Tobacco and Mahorka Industry **143,** being a symposium on the breeding, genetics and seed production of tobacco and mahorka, 1941, pp. 290-317.

The present article is concerned with the conditions of temperature which tobacco seeds require in order that their

germination capacity may be appraised in the shortest possible time. The scheme, in outline, of the experiments described was to soak samples of seeds at 30° and others at 40° C. for different periods of time—from 6 hours to 72 hours—and then germinate them at 20°, 25°, 30° and at temperatures alternating between 20° and 30° C. The effect of temperature was cumulative and seeds of the same age required more of what is defined as "temperature-hours" at the lower than at the higher temperatures in which germination took place, and after the short than the long period of maintenance at the temperature during the first stage, when the seeds were being soaked preparatory to germination proper. Furthermore, the younger seeds required fewer temperature-hours than the older. Young seeds which were physiologically immature began germinating sooner when subjected to alternating than to constant temperatures. The course of treatment recommended in the article enabled the germination of seeds to be determined within 144 to 216 hours. The oldest seeds were the slowest to germinate. *Nicotiana rustica* is considered separately. The conclusions indicated above were, in general, found applicable to this species which, however, germinated more quickly than ordinary tobacco, so that its germination could be determined within 120 to 144 hours.

640. CYGULEV, V. I. 633.71-1.531
The accuracy attained in determining the absolute weight of seeds of *Nicotiana tabacum*. [Russian.]
Publ. The All-Union (Mikojan) Research Institute of the Tobacco and Mahorka Industry **143,** being a symposium on the breeding, genetics and seed production of tobacco and mahorka, 1941, pp. 318-25.

The differences between the absolute weights of 1,000 tobacco seeds produced in a succession of years appear to be small and are, therefore, easily overlooked; but they may, nevertheless, be of significance in appraising the quality of the seeds. The method of determining the weight of 1,000 seeds at the Tobacco Institute consists in counting out two lots of seed, each containing 1,000 seeds, and then determining their average weight. The accuracy of this method, which is described in detail, was put to the test in nine varieties of tobacco, the seeds of which were tested, according to the method described, 25 times for each variety, being weighed on a balance showing accuracy to 1/1,000 g. The mean and other values were calculated and the results fully tabulated. The method gave rise to an error of 1·3%, which is well within the official limit of 5%.

641. ČIRKOVSKIĬ, V. I. 633.71-1.531
Germination in the glasshouse, the proportion of the resulting plants suitable for transplantation and the rate of sowing in relation to the germination of tobacco seeds in the laboratory. [Russian.]
Publ. The All-Union (Mikojan) Research Institute of the Tobacco and Mahorka Industry **143,** being a symposium on the breeding, genetics and seed production of tobacco and mahorka, 1941, pp. 256-89.

During experiments to determine the connexion between the percentage of seeds germinating in the laboratory and that of seeds germinating in soil in a glasshouse, it was found that the former was not a sure indication of how seeds will behave in soil, even under the favourable conditions of a glasshouse. Similarly, the sprouts of the younger seeds would sometimes emerge above the soil sooner than those of the older seeds, even though the germination percentage of the latter may be larger. It is evident that a low percentage of germination is not necessarily a good reason for rejecting a sample of seeds unless these are old, and storage has impaired their vitality. It was found that a sample of seeds of high germination value will give rise to a larger proportion of plants suitable for transplanting than seeds of low germination value, provided that they are not sown too thickly. Seeds having a germination percentage of 65 or more are considered preferable in this respect. Experimental results failed to justify any further differentiation of the interval between 65% and 100% germination. The rate recommended for sowing seeds having a germination percentage of 90 is 0·75 g. per square metre of glasshouse bed, and for values below 90% 0·9-1·0 g.

642. PAULSEN, E. F., AND LÍO, E. S. 633.71-2.951
Sobre el contenido de arsénico en el tabaco. **(Arsenic content in Argentine tobacco.)** [Spanish, English and Portuguese summaries.]
Rev. Fac. Agron. B. Aires, 1943, **10**: 357-62, bibl. 8.

Investigations of tobaccos produced and elaborated in Argentina showed that the arsenic content of the black cigarettes fluctuates between 10 and 15 parts per million, that of Virginian cigarettes between 5·8 and 16·6 p.p.m. and of natural tobacco, before elaboration, between 25 and 250 p.p.m.

643. CLAYTON, E. E., AND OTHERS. 633.71-2.3/4
Tobacco disease control by crop rotation.
Phytopathology, 1944, **34**: 870-83, bibl. 15.

The value of crop rotation as a control measure for tobacco root knot (*Heterodera marioni*), bacterial or Granville wilt (*Bacterium solanacearum*), stem rot (*Sclerotium rolfsii*) and Fusarium wilt (*F. oxysporum* var. *nicotianae*) was studied for 19 years at the Georgia Coastal Plain Experiment Station in definitely laid-out field plots. The results were not consistent and every disease seems to require a special treatment. There was no significant difference in root knot populations following the cultivation of susceptible and resistant crops. Only immune crops, such as peanuts, crotalaria and oats and a complete fallow reduced infestation with nematodes to a marked degree, but the fallow had a depressing effect on yield. Also in the case of other troubles it was found that figures for crop yield and the amount of disease are not always closely parallel. Although bacterial wilt cannot easily be starved out in the soil, as proved by a complete fallow of 4 years, the culture of corn for a year greatly reduced the amount of wilt in subsequent tobacco. The rôle played by the corn crop in controlling the wilt organism is not yet understood. In the case of *Sclerotium rolfsii* crop rotation was found not to affect the extent of stem rot incidence, but the exclusion of cotton and sweet potato from the rotation proved of great value in the control of *Fusarium* wilt. The growing of cotton previous to tobacco of the Orinoco type appears to be safe.

644. SMITH, J. H., AND ATHERTON, D. O. 633.71-2.796
Seed-harvesting and other ants in the tobacco-growing districts of North Queensland.
Qd J. agric. Sci., 1944, **1**: 33-61, bibl. 7.

A study was made of such ants as infest and damage tobacco seed-beds in Queensland. The ant species are named and their biology and distribution are noted. The simplest way of avoiding infestation is by establishing the seed-beds at some distance from the nests or by destroying the nests close to the site. Where that is impracticable it was found that a cover of fine river sand, $\frac{1}{8}$ in. deep, applied immediately after sowing, will give adequate protection from seed-harvesting ants without affecting germination. For ant species which feed on the cotyledons the broadcasting of maize meal as a bait at the rate of 12 oz. per 100 square feet has proved an effective means of control. The addition of Paris green to the maize is not necessary.

645. RAO, T. N. 633.71-1.57
Utilization of the waste products of tobacco.
Ind. Fmg, 1944, **5**: 359-61.

The pooling of all tobacco waste products in India for utilization as fertilizers and for other purposes is advocated. The *seed* of cigarette tobacco contains 25% of an edible oil which could be easily extracted. (Iodine value, hot drawn:

138·7.) The seed cake containing 1·15% potash and 1·6% phosphoric acid resembles castor cake in manurial value; being free of nicotine it could also serve as a cattle food. The N, P_2O_5 and K_2O content of seed ash is given as 0·16, 7·15 and 5·47% respectively. A conservative estimate puts the annual yield from tobacco seed as 2,000 tons of oil and 6,000 tons of cake. At the Tobacco Research Sub-station, Guntur, the *stalks* are burned on the seed-beds, which sterilizes the bed while at the same time the soil is enriched with potash (5·58%). Although *midribs* are easier to compost than stalks, it seems more profitable to convert this waste product into ash which is then a particularly rich source of potash (29-30% K_2O).

646. Saruhanjan, F. G. 633.79: 663.25
The yeasts of the epiphytic microflora of hops (*Humulus lupulus*) from different parts of the Armenian S.S.R. [Russian.]
Microbiological Symposium Acad. Sci. U.S.S.R., Armenian Branch, Biological Inst., 1943, **1**: 97-115.
Cultures of yeasts—mostly of the genus *Torulopsis*—were obtained from hop inflorescences with a view to comparing their capacities for fermenting straw. Samples of hops were collected from many parts of Armenia; when in a dry state the hops usually yielded a less abundant yeast flora than those which were green or still fairly succulent. Among the wild yeasts separated there were some which could thrive and multiply even on such a poor medium as straw, either with or without an admixture of ammonium sulphate, superphosphate and glucose; though the presence of all these substances was conducive to a more vigorous growth of yeast than was the presence of some or none of them. Before inoculation, the straw was scalded with boiling water in order partially to sterilize it. Fermentation lasted about 24 hours and then died down. The wild yeasts were compared with various cultivated types; they formed alcohol in amounts varying between 1·75% and 22·68%, and were sometimes as vigorous in fermenting grape juice and malt extract as were the cultivated yeasts. Among the wild yeasts some could be used not only for fermenting straw but for producing yeast feeds.

647. McLean, L. G. 633.8
Culinary herbs in North Carolina.
Ext. Bull. N. Carolina agric. Exp. Stat. **273**, 1944, pp. 15, bibl. 10.
Advice on the culinary uses and cultivation of over 30 herbs. Propagation, harvesting, curing and storing are also dealt with.

648. Ling, L., and Lin, K. R. 633.842-2.4
On the occurrence of *Colletotrichum capsici* in China.
Ind. J. agric. Sci., 1944, **14**: 162-7, bibl. 11.
Considerable damage has recently been caused to pepper and tomatoes, and to a lesser degree to eggplants, in the Chengtu Plain, China, by a ripe rot of fruits due to *Colletotrichum capsici*. The species was identified at the Szechuan Provincial Agricultural Improvement Bureau, China, by means of morphological and cultural studies as well as inoculation experiments.

649. Demidenko, T. T., and Ruhljadeva, N. M. 633.85-1.8
Some questions on the mineral nutrition of sunflower. [Russian, English summary.]
Izvestia Akademii Nauk S.S.S.R.—Ser. biol., 1944, No. 1, pp. 38-50, bibl. 11.
Workers of the Krasnodar Institute studied the minimum and maximum P, K and N intake of sunflower in water and sand cultures during various periods of its growth and development. The P requirements are at their peak for the period of time between the appearance of the shoots and the formation of the flower, the N requirements are highest between the formation of the flower and the end of flowering, and the K requirements highest between the formation of the flower and complete seed maturity. In its early stages of development the plant is able to store P and K if they are present in excess, and consequently to experience no deficiency in these elements when later they are only present in reduced amount in the nutrients available. It possesses a similar but less pronounced tendency with regard to N. A positive effect on the yield is produced by giving initially reduced doses of N, P and K and by bringing them up to the full dosage in subsequent developmental stages. In the case of P and N, an additional dose should be given at the time of formation of the flower, that of K should be given at a somewhat later stage of development.

650. Glenister, P. R. 633.85-2.19
Effects of iron deficiency on respiration of sunflower plants.
Bot. Gaz., 1944, **106**: 33-40, bibl. 16, being *Contr. Hull bot. Lab.* **561.**
1. Sunflower plants were grown in sand culture with nutrient solution. One group had iron salt as ferric citrate added to the nutrient solution; the other had no iron salt added. 2. The plants of the minus-iron treatment developed the typical chlorosis symptoms of iron deficiency; the controls were of normal color. 3. Respiration rate was depressed in the young chlorotic leaves of the iron-deficient plants. 4. The chlorotic leaves of the iron-deficient plants contained only half as much iron as comparable leaves of control plants. No relocation of iron from older to younger leaves occurred in the iron-deficient plants. In both the gradients were of decreasing iron content in going from the bottom to the top of the plants. 5. The iron contents of the leaves of a given plant of either treatment were found to be related to the ages of the leaves. The older contained more iron than the younger leaves. [Author's summary.]

651. Weibel, R. O. 633.85-1.531.17
Effect of seed treatment on castor beans.
J. Amer. Soc. Agron., 1944, **36**: 953-4.
In greenhouse tests, seed treatment of castor beans with New Improved Ceresan resulted in a very much better stand than that in the controls. The chemical proved also superior to Aresan. Under field conditions, however, the difference in germination percentages between treated and untreated seed was small.

652. Kaufmann, O. 633.85-2.76
Die Gesunderhaltung der Rapspflanze als Mittel zur Vermeidung starker Rapsglanzkäferschäden. **(Health controls *Meligethes aeneus* in rape.)**
Mitt. biol. Reichsanst., 1942, H.66, pp. 36, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 79-80.
A thorough investigation of the disputed effect of the pest *Meligethes aeneus* on the rape plant has been made. It was found that a variety which develops early in spring has a short sprouting period and starts flowering early, has the best prospect of escaping damage. It is interesting that a severe seems to cause smaller losses than a slight infestation. When 10 or 50 beetles were put in a bag around a rape plant the reduction in yield was greater than with bags containing 100 or 200 beetles. This is probably due to the fact that the injury has to reach a certain degree of severity before the remarkable regeneration power of the plant is stimulated. The combined effect of climate, plant development and pest is illustrated in a diagram which shows the reduction in yield to be expected under a variety of conditions.

653. Beĭkina, A. D. 633.85
The agro-biology of *Erysimum cheiranthoides* as an oil and medicinal crop. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1943, No. 3, pp. 47-8.
Erysimum cheiranthoides, an annual plant, occurs throughout Siberia, and an individual plant may carry up to 1,000 pods which may contain as much as 40,000 seeds. The yield of

oil varies, according to the method of extraction (benzene, hydraulic press, etc.) from 43% to 20%. The specific gravity, acidity, saponification and iodine number of the oil of *Erysimum* are 0·924, 3·22, 173 and 134-147 respectively. Thus it would appear that the oil is suitable both for industrial and culinary uses. It has been ascertained by special tests that medicinal substances remain in the oilcake made from its seeds. Field experiments showed that the greatest yield (700 kg. of seeds per ha.) was obtained from the seeds macerated in water for 24 hours before planting. The plant responds well to ordinary organic and mineral fertilizers, but it may also give a satisfactory (640 kg. per ha.) crop of seeds and a sizeable (150 kg. and over per ha.) yield of oil even on the poorest soil. On the experimental plots 1·5 kg. of seeds was sown per ha. and the seeds were planted by hand to a depth of 1 cm.

654. GAMAJUNOVA, A. D. 633.87
Tanning plants found along the valley of the river Syr-Daria. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 45-51.

Among the species of tanning value, those of *Salix* were most plentiful in bulk of material. *S. songarica*, in particular, was considered to be the best source of tanning substances. Other sources were *Statice* spp., *Calligonum* spp. and *Rheum tataricum*.

655. REVERDATTO, V. V. 633.88
Some new medicinal plants of the U.S.S.R. [Russian.]
Sovetsk. Botan., 1944, No. 1, pp. 44-7.

The following medicinal plants of Siberia were studied at the University of Tomsk:—*Polemonium coeruleum* L. This contains saponin. At the tuberculosis hospital of the University it was found to be a very good expectorant, and entirely satisfactory as a substitute for ipecacuanha and *Polygala senega*. Saponin is not confined to the roots but occurs through the whole plant. Water and alcoholic extracts have been successfully used for treating respiratory diseases. *Leonurus cardiaca* L. Medical tests at the University showed that extracts of this plant exerted a sedative effect on the nervous system, reduced the blood pressure and were useful in allaying diseases affecting the muscles of the heart. The plant was more effective than, and could replace, valerian. *Panzeria lanata* Pers. (*Leonurus lanatus*). In Europe this plant has been used as a diuretic. In Russia it has been recommended as a source of ethereal oils suitable for perfumery. In southern Siberia it is used among the inhabitants as a cure for dropsy, heart and nerve trouble, and for colds. At Tomsk its action has been shown to be the same as that of *Leonurus cardiaca*, than which it is more common and accessible in Siberia.

656. PONTOVIČ, V. E. 577.16: 633.88
***Aspergillus flavus* as a source of flavine.** [Russian.]
Biohimija, 1943, **8**: 297-300.

It has been shown that the yellow pigment in the mycelium of *Aspergillus flavus* is flavine (vitamin B_2) the quantity of which is 100 times greater than in yeast. Owing to its partial association with the proteins, flavine is incompletely extracted by means of aqueous solutions of methyl alcohol and acetone, but pyridine extracts it all. It is, however, difficult to get it pure. It was found that mycelium, free from spores, held no harmful substances and, in the form of pills, could safely and effectively be administered to human beings, the trouble and expense of extraction being thus obviated.

657. KURENCOVA, G. E. 633.88
Data on the biology and cultivation of *Panax ginseng* C. A. Mey. [Russian.]
Sovetsk. Botan., 1944, No. 1, pp. 47-50.

Ginseng grows very slowly and is often damaged by rodents. For the Chinese market, the form of the root is of paramount importance; it must resemble the human form, and must grow vertically downwards. In order to satisfy this requirement the plants must grow close together in soil which has been densely compacted after having been deeply worked, and they must grow from seed, without subsequent transplanting. Plants grown in a well-worked friable soil, with ample space around them, grow more quickly and form bigger roots; but the roots do not conform to the required shape. It is, therefore, difficult to grow quickly roots which are both big and shapely. If the roots suffer damage they become dormant and may fail to make any growth for some years, or they may produce double stems.

658. TUŠNJAKOVA, M. 633.88-1.541
The grafting of alkaloid plants. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, No. 10, pp. 24-31.

By means of grafting, various combinations were made between *Datura* spp., *Atropa belladonna*, potatoes, tomatoes and tobacco. According to the first four tables the amounts of alkaloids present in the resulting hybrids were determined largely by the stock. If this contained alkaloids and the scion belonged to a species without them, the combination produced alkaloids; if the stock contained no alkaloids though they were present in the scion, the combination as a whole contained little or none. An inspection of Table 5 shows that when an alkaloid scion, e.g. belladonna containing atropine, is grafted on a stock which does not contain atropine such as the potato, there is an increase in the quantity of the characteristic alkaloid in plants of the first generation derived from these grafts. When a non-alkaloid scion was grafted on an alkaloid stock (e.g. tomato on tobacco), the opposite trend was observed, the content of alkaloids decreasing with each succeeding generation. In both instances the trend of the alkaloid was towards the quantity of it present in the scion species. The author —differing from others—is of the opinion that alkaloids such as nicotine are formed in the roots, whence they are conveyed to the leaves and other aerial parts. Grafting affects not only the distribution of alkaloids but also morphological and other characters of the plants involved. For example, the grafting of tomatoes on potatoes resulted in a tomato plant with tuberous formations, a character which was transmitted to the following generation.

659. PEACOCK, S. M., LEYERLE, D. B., AND DAWSON, R. F. 581.192: 633.88-1.541.11
Alkaloid accumulation in reciprocal grafts of *Datura stramonium* with tobacco and tomato.
Amer. J. Bot., 1944, **31**: 463-6, bibl. 15.

The evidence suggests that alkaloid synthesis in *Datura stramonium* is confined principally to the root system of the intact plant.

660. PRESCOTT, J. A. 633.913(94)
The Australian homoclime of the zone of natural occurrence of *Parthenium argentatum*.
Reprinted from *Trans. roy. Soc. S. Australia*, 1943, **67**: 312-18, bibl. 11.

A comparative climatic study showed that the area extending from western slopes of New South Wales in the general direction of Charleville and Blackall in Queensland have a climate similar to the zones in Texas and Mexico where guayule naturally occurs.

661. MITCHELL, J. W. 633.913-2.111
Winter hardiness in guayule.
Bot. Gaz., 1944, **106**: 95-102, bibl. 4.

In this investigation at Beltsville, Md, an 8-10 hour exposure of unhardened guayule seedlings to a temperature of 22° F. resulted in severe injury, while stems and leaves of previously acclimatized transplants did not suffer from repeated exposure to 5-10° F. The strain A-5058, selected for frost resistance, was even found to withstand a 3-hour exposure to —5° F. with only slight root injury. Roots of this

selection survived a short exposure to a soil temperature of 16° F., although normally a prolonged exposure to a soil temperature of 26°-28° F. was found to cause severe injury. Examinations of plants severely damaged by frost 1-2 months after treatment showed that rubber content is apparently little affected by frost injury. Where frost protection is of interest in connexion with experimental plants it can be readily achieved by a mulch against temperatures near 0° F. Succulent greenhouse plants proved hardly less resistant to low temperatures than woody outdoor seedlings of the same age.

662. Powers, L., and Rollins, R. C. 633.913: 581.162.3
Reproduction and pollination studies on guayule, *Parthenium argentatum* Gray and *P. incanum* H.B.K.
J. Amer. Soc. Agron., 1945, **37**: 96-112, bibl. 26.
Preliminary to developing a satisfactory breeding programme for guayule its reproduction and pollination methods had to be studied. The results are presented under the headings: Intraspecific and interspecific pollinations.

663. Powers, L., and Gardner, E. J. 633.913: 581.162.3
Frequency of aborted pollen grains and microcytes in guayule, *Parthenium argentatum* Gray.
J. Amer. Soc. Agron., 1945, **37**: 184-93, bibl. 7.
It is suggested that both selection and hybridization would provide effective means of overcoming the low percentage of viable seed in guayule.

664. Nishimura, M. S., and others. 633.913-1.535
The propagation of guayule from cuttings.
Amer. J. Bot., 1944, **31**: 412-8, bibl. 6.
The propagation of guayule from cuttings was investigated at the Manzanar Relocation Centre, Owens Valley, Calif. No difficulty was encountered, the cuttings rooting freely at any time of the year. Best results were obtained in early spring, i.e. with cuttings about 2 in. long, taken after new growth had started, but before the stage of rapid elongation was reached. Later in the season the material should be cut 1-1½ in. below the growing point, immediately below a node. The use of growth hormones was an advantage only in the case of late-season cuttings which had been cut too long. Transplanted cuttings were found to become established sooner than transplanted seedlings. Although definite conclusions could not be drawn in view of great variability, it may be assumed that during the first year the rubber production of cuttings is markedly higher than that of seedlings.

665. Mitchell, J. W., Whiting, A. G., and Benedict, H. M. 633.913: 614.014.44
Effect of light intensity and nutrient supply on growth and production of rubber and seeds by guayule.
Bot. Gaz., 1944, **106**: 83-95, bibl. 8.
When potted guayule plants were subjected to a variety of light and nutritional conditions at Beltsville, Maryland, it was found that with plants grown at a relatively high nutrient level a linear relationship existed between light intensity and rubber production. A 25% reduction in light was associated with a 36% drop in the amount of rubber stored. In contrast, the rubber production of plants grown at a low nutrient level was hardly affected by shading. At both nutrient levels a reduction in light intensity was found to stimulate seed production and to cause a marked decrease in the number of leaves remaining green during the winter. Under full light intensity there was no difference in resin content between plants grown with a limited and with a full supply of nutrients. With plants grown in fertile soil a 25% reduction in light intensity was associated with a decrease in stem and root weight of 14·6%, whereas the same amount of shade was beneficial to leaf production in plants grown in infertile soil.

666. Wadleigh, C. H., and Gauch, H. G. 633.913-1.415.3
The influence of high concentrations of sodium sulphate, sodium chloride, calcium chloride and magnesium chloride on the growth of guayule in sand culture.
Soil Sci., 1944, **58**: 399-403, bibl. 4.
The expansion of guayule culture in the south-west, where salinity is prevalent in irrigable soils, made it desirable to determine the tolerance of guayule to 4 salts at osmotic pressures ranging from 0·5 to 3·5 atmospheres. The most striking observation made in these sand cultures was the toxicity of $MgCl_2$ which killed the plants at the low pressure of 1·5. The species was further found to be very tolerant of $CaCl_2$, but relatively sensitive to sodium salts, more so to Na_2SO_4 than to NaCl. Guayule cannot therefore be regarded as salt-tolerant.

667. Broyer, T. C. 633.913-1.536
Renewal of growth by guayule transplants.
Plant Physiol., 1945, **20**: 137-41, bibl. 6.
An account of observations made at the University of California, Berkeley, and reported in 1944. When transplanted to soil in the greenhouse the power of regeneration in guayule was found to decrease progressively as the season advanced from winter toward summer. The inhibition was much less pronounced when the plants were placed in nutrient solutions, but aqueous solutions proved even more favourable to rapid regeneration and produced a higher percentage of renewed growth. Various levels of soil moisture, subjecting the plants to low temperatures previous to transplanting, pre-soaking the roots and many other treatments had no effect on the ability of the plants to resume growth. Also growth substances failed to exert any beneficial influence. The problem, as it presents itself on the basis of these negative results and in the literature, is discussed.

668. Addicott, F. T., and Pankhurst, J. B. 633.913-1.432
Some anatomical effects of moisture stress in nursery seedlings of guayule.
Bot. Gaz., 1944, **106**: 208-14, bibl. 8.
In this study at Santa Barbara College, University of California, an anatomical examination of guayule nursery seedlings, which had been subjected to three levels of moisture stress, showed that low moisture stress leads to a larger pith and greater cambial activity associated with an increase in rubber-bearing capacity, while the rubber concentrations and the lignin content in the tissues was higher under conditions of high moisture stress, which was accompanied by a considerable enlargement of the resin canals.

669. Kelley, O. J., Hunter, A. S., and Hobbs, C. H. 633.913-1.536
The effect of moisture stress on nursery-grown guayule with respect to the amount and type of growth and growth response on transplanting.
J. Amer. Soc. Agron., 1945, **37**: 194-216, bibl. 34.
The results of this experiment carried out at Salinas, California, show clearly that guayule plants grown under high moisture stresses in the nursery are much smaller, but have a much higher percentage survival (over 90%) on transplanting and recover much more quickly than plants from generously irrigated plots. Plants grown under dry conditions may be transplanted at any time of the year, no previous hardening period being required, as in the case of plants from high moisture plots. Growing guayule seedlings under a high moisture stress has the additional advantage of reducing fertilizer needs, the necessity for weed control and susceptibility to diseases. The fact that plants from dry plots have higher rubber and lignin contents and a higher inulin content in the autumn is a point of theoretical interest. Root penetration of plants grown under both

high and low moisture stress was about 42-48 in. Water was absorbed almost entirely from the top soil as long as it was available in this region. A further research programme is outlined. It is suggested that the fundamental principles discussed in this paper may be applicable also to the transplanting of ornamental shrubs, softwoods and hardwoods.

670. Bonner, J., and Galston, A. W. 633.913-1.453
Toxic substances from the culture media of guayule which may inhibit growth.
Bot. Gaz., 1944, **106**: 185-98, bibl. 19.

1. The experiments [conducted at the California Institute of Technology, Pasadena] indicate that substances unfavorable to the growth of guayule plants emanate from the roots of actively growing plants of this species. These substances are organic in nature and can be extracted from nutrient solution which has previously been flushed through gravel cultures of guayule plants. 2. The growth-inhibitory extracts were assayed for their toxic activity by application to guayule seedlings grown in solution cultures under standard conditions. 3. The growth-inhibitory substances contained in nutrient solution which has been recirculated through guayule cultures are ether-soluble acidic compounds. They were not, however, isolated in pure form. 4. A potent source of growth-inhibitory substance was found in water in which guayule roots were allowed to soak briefly. From this water two compounds inhibitory to the growth of guayule plants were isolated in crystalline form: cinnamic acid and a second unidentified organic acid. [Authors' summary.]

671. Mitchell, J. W., Benedict, H. M., and Whiting, A. G. 633.913-1.811.9: 546.27
Growth, rubber storage, and seed production by guayule as affected by boron supply.
Bot. Gaz., 1944, **106**: 148-57, bibl. 14.

Studying the boron requirements of guayule in gravel cultures at Beltsville, Md, the authors found the tolerance range and, at the same time, the optimum dosage for vegetative growth, seed and rubber production to lie at a concentration of 0·1-2·0 p.p.m. Boron deficiency and excess of boron affected the vegetative growth and were associated with a reduction in rubber production. Seed production was adversely affected only by boron deficiency.

672. Altuhov, M. 633.913-1.531
Clump sowing of *Taraxacum kok saghyz*. [Russian.]
Social. Seljsk. Hoz. (Socialistic Agriculture), 1944, No. 4, pp. 53-7.

The author describes in detail the technique of clump sowing of *T. kok saghyz*, at the Mihnero Experimental Station in Baškiria, which must be done by hand. In a number of comprehensive tables a comparison is made between this and the usual method of sowing. The yield of roots was 35 centners per ha. from the former and 32 from the latter method, the inevitable loss of roots being 0·5 and 3·0 centners per ha. respectively, and a total of 109 and 249 man days [excluding the labour expended on collection of seeds] being required for the respective methods. Similar results were obtained at other experimental stations in the U.S.S.R. A 30-days stratification of seeds seemed to improve the yield of roots when clump sowing by hand was carried out in mid-April.

673. Samoĭlov, I. 633.913
Some observations and experiments concerning the cultivation of kok saghyz. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 9-12.

The experiments described show that the germination and yield of kok saghyz are to a considerable extent determined by the quality of the soil. A soil wanting in humus does not yield good crops. Lime is an important requirement of kok saghyz and an economical method of applying it in small quantities, mixed with artificial manures, is recommended. Lime thus applied greatly increased the yield of root, though the proportion of rubber in the roots was not increased. The practice of transplanting is advocated, since it saves seed and enables the dandelion to be eliminated and gaps in an existing crop to be filled in. Transplanting the seedlings in groups gave better results than transplanting singly. Bunching and other methods of limiting the density of the stand were tried. Though an unthinned crop yielded the greater weight of roots, thinned roots were of a better shape and more convenient to lift. Removal of inflorescences failed to increase either the yield of roots or the content of rubber.

674. Giljarov, M. S., and Pravdin, F. N. 633.913: 581.162.3
The ecology of pollination in kok saghyz. [Russian.]
Izvestia Akad. Nauk S.S.S.R.-Ser. biol., 1943, No. 6, pp. 243-60.

Fertilization in *Taraxacum kok saghyz* Rod. is effected almost entirely by insects. In the first season, flowering lasts from midsummer until the frosts begin; in the second season, from early summer until midsummer when, seed having ripened, the dormant period begins. Flowering is not over quickly; all stages of it may be observed on one plant. An inflorescence is open to pollination for about 4 or 5 days in the European part of the U.S.S.R. During this interval it is closed to insects during the night. During bright, hot, dry days it remains open to pollinating insects for a shorter time than during dull weather which, moreover, prolongs the flowering period as a whole. During cold, rainy weather it is closed entirely. The cross-pollination of kok saghyz growing wild is effected mostly by species of *Halictus*; but cultivated crops are more often pollinated by hive bees. The bees—both *Halictus* spp. and hive—account for most of the pollination and operate when the temperature is about 17° C. or more. Below 17° C. various species of flies effect some pollination but not so completely as the bees. About 1,000 hive bees are necessary to pollinate 1 hectare of kok saghyz. Their radius of operation is about 3 km.

675. Zaĭceva, A. 633.913-2.452
Combating kok saghyz rust by chemical means. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, Nos. 2-3, pp. 45-7.

The infection of kok saghyz with *Puccinia taraxaci* is increasing annually. Among the compounds used as sprays, the following were tested: bordeaux mixture, lime-sulphur, Solbar (polysulphides), and what is described as gas sulphur paste. The last-mentioned proved very effective. It has the further advantages of being a by-product, more plentiful and more easily prepared than the others. Frequent applications are necessary.

676. Akseljrod, D. 633.913
Conditions affecting regeneration, and the productiveness of the regenerated plants of tau saghyz. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1944, Nos. 2-3, pp. 36-9.

Plants of tau saghyz, after a crop has been lifted, readily emerge and propagate themselves. Most of them are produced by the branch roots left in the ground, but those arising from the remnants of the main roots are more vigorous; they bear more leaves and produce more seed. The depth of digging, and other conditions which prevail while the roots are being lifted determine the vigour with which the crop regenerates, hence the present experiments to find out how regeneration, consonant with a good yield of the final crop, can best be ensured.

677. KLASSEN, J., AND GRACE, N. H. 633.913-1.56
Resin-rubber from Canadian grown plants. III. Preliminary pilot plant extraction of gum from milkweed leaves.
Canad. J. Res., 1945, **23**, Sec. F, pp. 39-47, bibl. 4.

The milkweed resin-rubber has possible value as a blending agent for synthetic rubber GR-S. The paper deals with the technique of extraction.

678. JURKEVIČ, I. D. 633.917
Changes in the guttapercha content of *Euonymus verrucosa* Scop. in relation to the time of year and the stage of development. [Russian.]
J. Bot. U.R.S.S., 1944, **29**: 274-81.

The content of guttapercha in the roots of *Euonymus verrucosa* amounted to 14·43% in April, when the buds were opening, and fell to 9·64% in July and 8·38% in August, when the fruits were developing and ripening. From this point it rose again to reach 15·33% in December. This and other evidence leads to the conclusion that guttapercha is more than an inert by-product of metabolism, and that the best season during which to extract it is spring or, failing that, autumn.

679. WORK, P. 635.11: 631.531.2
Effect of shearing on performance of beet seed.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 418-20.

The process of shearing tends indirectly to reduce the labour of thinning, but it is suggested here that both shearing and thinning could be eliminated by the use of a planter which drops a single seed ball at a time and by adjusting the rate of seeding. No details are given of such a planter.

680. WOODMAN, R. M., AND PAVER, H. 635.13: 631.8
The nutrition of the carrot. II. Growth in a fen soil.
J. agric. Sci., 1945, **35**: 30-2, bibl. 2.

The effect of phosphate deficiency and phosphate applications on carrots of the Chantenay type grown in a black phosphate-deficient fen soil from Swaffham Fen, Cambs., was studied at the School of Agriculture, Cambridge. In the no-phosphate pots the cotyledons, and sometimes the whole plant, were dark bronze, while phosphate applications were followed by an increase in yields. There was a tendency of nitrogen and potash applications to depress yields. The full data on the response to different fertilizer treatments are tabulated.

681. RYGG, G. L. 635.13: 581.192
Sugars in the root of the carrot.
Plant Physiol., 1945, **20**: 47-50, bibl. 14.

Evidence is offered that in the carrot varieties Danvers and Imperator fructose is present in the roots in quantities approaching one-half of the content of total reducing sugars. The investigation was carried out at the Division of Fruit and Vegetable Crops and Diseases, Pomona, Calif.

682. STUBBS, L. L., AND GRIEVE, B. J. 635.13: 632.8
A new virus disease of carrots.
J. Dep. Agric. Vict., 1944, **42**: 411-2, 415, bibl. 2.

ANON.
A new disease of carrots.
Agric. Gaz. N.S.W., 1944, **55**: 493-4.

A preliminary report on a new virus disease of carrots, causing such severe damage in different areas of Victoria that commercial production is restricted to the summer months. An infected crop gives the impression of unthriftiness suggestive of a mineral deficiency. As symptom expression varies not only from plant to plant but also according to age a description of the symptoms is given separately for young plants, for plants at an intermediate stage and for plants approaching maturity. Infection experiments showed the aphid *Cavariella aegopodii* to be the vector. Moreover, a close relationship was observed between the infestation of carrots with this aphid and the incidence of disease. The West Australian variety (synonym: Osborne Park and others) and a local selection were found to be tolerant to the virus. Surveys made in New South Wales indicate that the disease is present there also and causes appreciable loss.

683. WILSON, G. F. 635.13: 632.77
The carrot fly and its control in gardens.
J. roy. hort. Soc., 1945, **70**: 84-9, bibl. 5.

Investigations on the control of the carrot fly (*Psila rosae*) in conditions prevailing in gardens and allotments have been carried out at Wisley for 3 years, 1942-4. For reasons fully explained in the paper the following recommendations were made for avoidance of the fly. Choose a fresh site annually for the carrot crop. Avoid using or burying fresh organic manure. Sow thinly to avoid singling. Destroy all thinnings immediately. Tread and water freshly singled rows. Use a repellant (creosoted string along the rows or powdered naphthalene) after singling 3 times at 10-14 days intervals. Sow late May-June, and main crop in July. Sow in open, windswept positions, especially away from hedges or other sheltered sites or in isolated rows between other crops except potatoes. Avoid hand-weeding within the rows. Lift and clamp in October, not later. Allow poultry, if possible, free run of the ground after harvesting. Feed heavily infested roots to stock to ensure destruction and refrain from digging them in.

684. SWEET, R. D., HUNKEL, R., AND RALEIGH, G. J. 632.954: 635.13
Oil sprays for the control of weeds in carrots and other vegetables. (Preliminary report.)
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 440-4, bibl. 6.

LACHMAN, W. H.
The use of oil sprays as selective herbicides for carrots and parsnips.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 445-8, bibl. 5.

Under both New York and Massachusetts conditions oil sprays appear to offer a ready means of weed control in umbelliferous crops. Possible snags are discussed.

685. SAÏD, H., AND EL SHISHINY, H. 635.15: 581.12
The effect of disc thickness on the respiration and the various nitrogen fractions of cut discs of radish roots immersed in water and sucrose solutions.
Plant Physiol., 1944, **19**: 660-70, bibl. 9.

In experiments described from the Botany Department Fouad I University, Cairo, Egypt, respiration was increased, nitrate reduction was greater and sucrose uptake and protein synthesis were both increased as the thickness of the discs decreased (from 4 to 1 mm.). The nitrogen fractions chiefly involved in the protein synthesis were the nitrate and "other nitrogen". Amide and ammonia nitrogens were not affected by variation in disc thickness.

686. BENNETT, E. 635.25: 581.12/13
Some aspects of the metabolism of the Ebenezer onion.
Plant Physiol., 1945, **20**: 37-46, bibl. 13, being *Contr. Mass. agric. Exp. Stat.* **517.**

An analytical study of the tops and bulbs of Ebenezer onions grown in soil and in water cultures revealed two distinct seasonal trends prevailing during about two-thirds and one-third respectively of the total growth period. During the first period the marked photosynthetic activity was accompanied by a rapid increase in dry weight and later by a softening of the neck, while the decline in photosynthesis during the second period was associated with a removal of the solutes to the bulb. Consequently, as illustrated by diagrams, the content of total ash and of all nitrogen fractions in the tops was found to decrease with maturity accompanied by an increase in soluble sugars up to

about the 65th day. The increase of all constituents in the bulbs was continuous. During the second period amides were shown to accumulate in the bulb where reduction of nitrates seems to take place at maturity, 80% of the total nitrogen being soluble. Keeping water cultures in complete darkness for 139 hours had the effect of slowing down the transportation of solutes from the tops.

687. HOLDSWORTH, M., AND HEATH, O. V. S. 635.25: 632.482
Ripening of the onion bulb and infection by *Botrytis* species.
Nature, 1945, **155**: 334, bibl. 3.

It is shown that the collapse of the neck of the onion plant at bulb ripening is purely mechanical and is caused by the absence of the three next internal leaf initials due for emergence. They become, instead, swollen bulb scales and there is no more support for the thin-walled hollow tube of the last emerged leaf, which consequently falls over. Thus the common horticultural practice of bending over the neck to assist ripening is useless, for, if bulbing is not advanced enough to stop leaf emergence, the next emerging leaf blade will be broken or bruised, and, if leaf emergence has ceased, the neck will collapse of itself. There seems no reason why this should either hasten the drying of the leaf blades or the onset of dormancy. *Botrytis* infection, a major problem in onion growing, reaches the onion bulb via an open pore which is no longer blocked by the leaf initial, since this having become a swollen bulb scale fails to elongate. Another likely path of infection is via the pores of the older leaves, since these sag open as the leaves wither and provide pockets for the lodgment and high humidity for the development of airborne spores. Infection via these pores was observed at the Research Institute of Plant Physiology, Imperial College of Science and Technology, where the experiments were made.

688. HELLMERS, E. 635.25: 632.482
***Botrytis* on *Allium* species.** [English.]
Medd. VetHøjsk. Kbh. **24**, 1943, from *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 206-7.

Botrytis allii was identified by the author as the most common cause of onion neck rot in Denmark. Although a relative humidity of 95-100% and a temperature of 20-25° C. were found to be the optimum conditions for the fungus, it proved capable of making growth at a much lower humidity and within a temperature range of 3-30° C. Further observations showed that the outer skin of the bulb, if it is dry and undamaged, provides a protection against *Botrytis* infection. A succulent outer skin, on the other hand, facilitates the penetration of the fungus, as does any slight wound. The author confirmed earlier reports that red onions are less susceptible to rot than yellow. Apart from handling the crop with the necessary care the following control measures are recommended: (1) Disinfect onion sets with Aretan, (2) spray in wet years with bordeaux (2: 2: 100) and (3) do not hasten ripening by topping, as the resulting wounds may serve as an entrance for the fungus.

689. BOOER, J. R. 635.25: 632.4
Control of white rot in onions.
Nature, 1945, **155**: 241-2, bibl. 1.

The Horticultural Research Department of Messrs. W. H. Berk & Co., London, report successful control of *Sclerotium cepivorum*, white rot of onions, in 1943 and 1944 by the application of a 4% calomel dust to the seed drill immediately before sowing. One pound to 50 yds. gave good results with salad onions from March sowings but on bulb onions grown from seed 1 lb. per 25 yds. was better. The variety was James Keeping.

690. WALKER, J. C., JONES, M. A., AND CLARKE, A. E. 635.25: 631.521.6
Smut resistance in an *Allium* species hybrid.
J. agric. Res., 1944, **69**: 1-8, bibl. 12.

A hybrid between the susceptible species *Allium cepa* and *A. fistulosum* resistant to *Urocystis cepulae* showed some rust resistance in F_1, but unfortunately it proved self-sterile. Means of overcoming this handicap in further breeding experiments are discussed. The investigation is a co-operative study of the Bureau of Plant Industry, Soils and Agricultural Engineering and the Wisconsin Agricultural Experiment Station.

691. NICOLAISEN, N., AND SCUPIN, L. 635.25: 632.482
Neck rot of onions. [German.]
Z. LebensmittUnt. Forsch., 1943, **86**: 208-17, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 193-4.

As a result of trials with onions harvested at different stages of maturity and stored under a variety of conditions following different pre-treatments it was found that it was of greatest importance that the necks should have dried completely before cleaning. Drying in the fields was much superior to artificial drying, though the latter gave a certain control of neck rot (*Botrytis allii*), provided the bulb was not previously infected. Harvesting in an immature stage was no disadvantage if the bulbs were left to dry, but cleaning in the green or half-mature stage made the bulbs susceptible to neck rot. Susceptibility to *Botrytis* was greatly increased also by a preceding attack of *Peronospora schleidenii* in the field. Storage at room temperature caused greening, particularly with bulbs harvested in the mature stage. The tendency to greening was higher at a storage temperature of −2·5° C. than at +1° C. The content of monosaccharides in onions was constant, independent of stage of maturity at harvest, and remained so during storage. However, there was a positive correlation between disaccharide content and keeping quality. During the drying period in the field the refractometer value and the acid content were found to increase. Onions with good keeping quality showed a high osmotic pressure.

692. MÜLLER, K. R. 635.25: 632.77
The onion fly and its control. [German.]
Kranke Pfl., 1944, Vol. **21**, p. 37, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 205-6.

The following method of controlling onion fly is to be applied in Saxony; it consists in the use of baits made of halved onions poisoned with sodium fluoride. Twelve and a half kg. medium-sized onions, 150 g. sodium fluoride and 150 g. sugar in 5 l. rain water are used for ¼ hectare. The onions have to be kept in cool storage during the winter to be sufficiently fresh. They should be cut at least 4 days before dipping them into the toxic solution, not later than 15 May. Immediately afterwards the bait is put out in the field by a gang walking along the rows and depositing half an onion every third step. One person goes along the 5th row from the outside, the others follow at a distance of 15 rows. The putting down of the bait at equal distances, so as to show rows sideways as well, is said to be important. The cut surface should face upwards and lie horizontally. The onions should be dipped again within 8 days after two flies, on the average, have been counted per bait. Comparative figures of the results obtained are not reported.

693. DETJEN, L. R. 635.34: 631.532.1
Fixation of cabbage varieties.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 362-6, bibl. 6.

Cabbage seed plant material can be propagated in the following three ways:—(1) Using healthy vigorous leaves, see *ibidem*, 44: 491; (2) using slips, see *ibidem*, 44: 491, or (3) using offset-like growths produced on seed branches of cabbages, which, either naturally or by artifice, are more vegetative than reproductive in character during their normal seeding year. Method 3 is described in detail in this paper.

694. Poole, C. F., Grimball, P. C., and Kanapaux, M. S. 635.34: 577.16
Factors affecting the ascorbic acid content of cabbage lines.
J. agric. Res., 1944, **68**: 325-9, bibl. 9.

The work was performed at the U.S. Regional Breeding Laboratory, Charleston, S.C. There is a significant degree of negative correlation between ascorbic acid concentration and head weight among 25 breeding lines of cabbage grown as 3 replicates in the fall and 3 in the spring. Of the six lines with more consistently high ascorbic acid content, judged by adjusted ranking, three were above average in head weight. Regression data show that hereditary differences are more important than seasonal or positional differences in producing ascorbic acid differences between breeding lines. Seasonal effect on ascorbic acid is expressed chiefly on head size and secondarily on genetic constitution. Only six lines differed significantly in ascorbic acid content from season to season. In only one of these was the content higher in the fall than in the spring. [Authors' summary.]

695. Maier, W. 635.34/36: 632.19: 546.27
Bormangel an Weisskohl, Rotkohl, Wirsing, Rosenkohl im Gefässversuch und Freiland. **(Boron deficiency in cabbage, red cabbage, savoy and brussels sprouts in pot experiments and in the field.)**
Gartenbauwiss., 1944, **18**: 288-303, bibl. 5.

The symptoms of boron deficiency in cabbage, red cabbage, savoy and brussels sprouts, as they became manifest in sand and water cultures, are described and illustrated in detail. Complete boron deficiency in water cultures was remedied by the addition of 1 mg./l. boric acid. The symptoms shown in the field as a result of boron deficiency were similar to those observed in pot experiments. A dressing of 4 g./m.$_2$ borax reduced the number of diseased plants and increased the boron content in the plants, though not to the level of plants grown on non-deficient soils. The application of 4 g./m.$_2$ droved therefore insufficient to eliminate the trouble completely. The trials were carried out at Geisenheim.

696. Reinhold, J. 635.41: 612.014.44
Der Einfluss der Tageslänge und der Lichtintensität auf das Wachstum der Reichsspinatsorten. **(The influence of length of day and light intensity on the growth of German spinach varieties.)**
Gartenbauwiss., 1944, **18**: 266-87, bibl. 3.

Spinach plants of different varieties were sown at the beginning of July at Pillnitz on Elbe and subjected to daily light treatments of 11, 12, 13 hours and the full day respectively. Only the unshortened day treatment produced flowers in all varieties, though after periods of varying length. In varieties which did not bolt readily vegetative growth was stimulated by long exposures, while more easily bolting varieties reached their optimum with shorter day treatment. Similar results were obtained with plants sown at the middle of May and exposed for 8 and 12 hours and unshortened days respectively. A list of 8 varieties is given in the order of their liability to bolt, the first four being suitable for late spring sowings and the last four for early spring and late summer sowings. The effect of light intensity was studied in shading experiments and it was shown that dry weight increased with light intensity. The group of early bolting, quickly growing varieties was found to require less light intensity and therefore to be more suitable for intercropping. Bolting was reduced only in the case of severe light deficiency (19·3%).

697. Scripture, P. N., and McHargue, J. S. 635.41-1.811.9: 546.27
Effect of boron concentration in the nutrient solution on the soluble and insoluble nitrogen fractions of spinach.
J. Amer. Soc. Agron., 1944, **36**: 865-9, bibl. 8.

Spinach plants grown in sand cultures at boron levels of 0·25, 0·5, 1·00 and 5·00 p.p.m. were found to increase the rate of photosynthesis as the boron concentration increased. The optimum concentration for growth was 1·00 p.p.m. These results, obtained at the Kentucky Agricultural Experiment Station, support the view that boron has a definite function in the formation of proteins from inorganic nitrogen and carbohydrates.

698. Ministry of Agriculture (Taylor, H. V., and Skillman, E. E.). 635.48
Rhubarb.
Bull. Minist. Agric. Lond. **113**, 1944, pp. 24, bibl. 19, 9d.

The bulletin contains a historical note, a classification and description of the principal varieties of rhubarb and an account of modern commercial methods of growing naturally and by forcing. Diseases and pests—which are few—are briefly mentioned, and notes are given on grading, packing, and marketing. The main production areas are in Yorkshire, Lancashire, Cheshire and Essex.

699. Thompson, R. C., and Horn, N. L. 635.52: 631.531
Germination of lettuce seed at high temperature (25° to 35° C.) stimulated by thiourea.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 431-9, bibl. 8.

In trials in Maryland lettuce seed was treated with 0·5% solution of thiourea under several conditions of temperature, time and exposure to light. In all cases thiourea-treated seed gave a higher percentage of germination at temperatures above 30° C. The most effective treatment for successful germination was 8 to 10 hours at 18° C. in darkness and then removing the seed and drying it off rapidly.

700. Beckenbach, J. R., and others. 635.52
Crisp-head lettuce in Florida. A preliminary report.
Bull. Fla agric. Exp. Stat. **365**, 1941, pp. 19, bibl. 10.

In a two years' test of all commercial crisp-head lettuce varieties and strains, which might be adaptable to production in Florida, it was shown that Imperial No. 44 is the least susceptible to bolting and the surest to head under most Florida conditions. Recommendations are made for optimum manuring and spacing.

701. Pryor, D. E. 635.52: 632.8
The big vein disease of lettuce in relation to soil moisture.
J. agric. Res., 1944, **68**: 1-9, bibl. 6.

The experiments carried out on two Californian soils have shown that the control of soil moisture does not offer any hope of reducing big vein in lettuce. It is recommended that tests for the resistance of lettuce strains to big vein should be conducted on well-watered soil, since the symptoms become manifest very early under these conditions.

702. Thompson, R. C., Doolittle, S. P., and Smith, F. F. 635.52: 632.8
Investigations on the transmission of big vein of lettuce.
Phytopathology, 1944, **34**: 900-4, bibl. 4.

It has been conclusively proved at Beltsville, Md, that the big vein disease of lettuce is soil-borne and can be eliminated by steam sterilization of the soil. The results suggest that the root aphid *Pemphigus lactucae* may be a vector. All attempts to transmit big vein by inoculation have been unsuccessful.

703. Selman, I. W. 635.52: 632.8
The susceptibility of lettuce to mosaic virus in relation to nitrogen, phosphate and water supply.
J. Pomol., 1945, **21**: 28-33, bibl. 1.

At Cheshunt Research Station Cheshunt Early Giant lettuces growing in a mixture of peat and sand and receiving all combinations of 3 levels of N and P and 2 of watering

were most susceptible (100% infection) to lettuce mosaic when receiving high N and medium P. Plants receiving low N, low P and medium watering were most resistant (12½% infection). The available N content of the soil may be of importance in determining susceptibility to infection. Infection with lettuce mosaic at the 4-6 leaf stage resulted in 68% reduction in fresh weight compared with the controls.

704. TOWNSEND, G. R. 635.53: 632.4
Controlling damping-off and other losses in celery seedbeds.
Bull. Fla agric. Exp. Stat. **397**, 1944, pp. 27.

This discussion on the control of losses from various causes in celery seedbeds in Florida is based on extensive trials and includes the following recommendations: (1) Rake the bed level to avoid uneven water distribution with resulting fertilizer injury in the dry spots and damping off in the wet spots. (2) Apply 20 lb. of commercial fertilizer per 100 yd. bed (4 ft. wide) on muck soil. (3) During the period of germination and early growth maintain a water level of 2-3 in. from the surface of the soil and apply double shading during the warmest weather, gradually exposing the plants to increasing amounts of sunlight. (4) Control damping off by dusting at frequent intervals with a 10% fermate dust at the rate of ½-1 lb. per 100 yd. bed; or by frequent spraying or drenching with a fermate or thiosan spray at ½ lb. to 50 gal. or cuproxide at ¾ lb. to 50 gal., or spergon at 1½-2 lb. to 50 gal. Spraying or drenching have proved superior to dusting at the stage when the plants form a mat of foliage. (5) Do not use more than 2 oz. of seed, if fungicidal treatment is intended, since overcrowding increases susceptibility to damping off.

705. ARK, P. A. 635.53: 632.314
Crater rot and blotch of celery, a new aspect of soft rot caused by *Erwinia carotovora*.
Phytopathology, 1945, **35**: 140-2.

A destructive celery disease is described and illustrated. This is caused by *Erwinia carotovora*, but it produces symptoms other than heart rot. In the initial stage small spots appear near the base of the petioles, developing into dark brown sunken regions, later the affected tissues dry out and collapse. In some years, losses from crater rot and blotch are severe in California, where the investigation was made. Diseased stalks must not be left in the ground.

706. TOWNSEND, G. R. 635.53: 632.48
Spraying and dusting for the control of celery early blight in the Everglades.
Bull. Fla agric. Exp. Stat. **366**, 1942, pp. 26, bibl. 8.

The effectiveness of various spraying and dusting materials in controlling *Cercospora apii*, the early blight fungus of celery, was compared for a period of 11 years. A modification of the old bordeaux formula to a 4-4-50 mixture in winter and a 4-2-50 mixture in spring and autumn, prepared from easily soluble copper sulphate and hydrated lime and applied once a week at the rate of 100-120 gal. per acre at 300 lb. pressure, was found to combine excellent control with a minimum of injury. It was an advantage to add 2 lb. of wettable sulphur to the spray, which may also be supplemented by nutritional materials. For dusting, a 20-80 and a 50-50 copper-lime dust are recommended at the rate of 30 and 20 lb. respectively. Where vapo-dusting equipment is available cuprous oxide dusts may safely be applied on dry foliage.

707. RICHARDS, J. G. 635.54
The growing of chicory.
N.Z. J. Agric., 1944, **69**: 581-3.

The area normally devoted to chicory (*Cichorium intybus*) in New Zealand does not exceed 100 acres. The crop is traditionally grown on the island of Inch Clutha in South Otago and has recently been introduced near Christchurch. Soil requirements, place of rotation, time of sowing, intercultivation and harvest are discussed. Average yields in New Zealand are about 10-11 tons. Four tons of green roots will yield 1 ton of dried material suitable for grinding.

708. WALKER, M. N. 635.615: 632.48
***Fusarium* wilt of watermelons. I. Effect of soil temperature on the wilt disease and the growth of watermelon seedlings.**
Bull. Fla agric. Exp. Stat. **363**, 1941, pp. 29, bibl. 8.

The relations between host and wilt organism in water melons was shown to constitute an exception to the general rule, in that the optimum temperature for germination and growth of early water melon and citron seedlings (31-33° C.) lies above that for infection by *Fusarium bulbigenum* var. *niveum* (27° C.). Above 30° C. infection was found to decline rapidly. Crosses between *Fusarium* wilt-resistant citron strains and susceptible water melons failed to produce resistant F_1 plants. Data are presented for the tolerance of seedlings to soil temperatures.

709. BUCHINGER, A. 635.62
Die wichtigsten europäischen Kürbisarten. (The most important European pumpkin, squash and gourd species.)
Gartenbauwiss., 1944, **18**: 311-32, bibl. 15.

A general discussion of the value of different parts of the fruit (kernel, kernel oil, kernel cake, ground kernel husks and pulp) of pumpkins, squashes and gourds grown in Hungary and Croatia and of the origin and characteristics of *Cucurbita pepo*, *C. maxima*, *C. moschata* and *C. ficifolia*.

710. HUTCHINS, A. E., AND SANDO, L. 635.62
Gourds. Uses, culture, identification.
Bull. Minn. agric. Exp. Stat. **356**, 1941, pp. 35, bibl. 51.

A study of the cultivation of the ornamental gourd. The numerous types are illustrated in a manner that should make identification easy. Fifty-one titles are listed of books and articles of interest to the student and grower of gourds.

711. BUCHINGER, A. 635.62: 581.44/45
Kürbisranken. **(Cucurbit tendrils.)**
Gartenbauwiss., 1944, **18**: 304-10, bibl. 5.

A morphological definition of pumpkin, squash and gourd tendrils, as opposed to shoots, is given and their function is discussed. Various types of tendril are illustrated by 10 photos.

712. DANIELSON, L. L. 635.63: 612.014.44
Effect of daylength on growth and reproduction of the cucumber.
Plant Physiol., 1944, **19**: 638-48, bibl. 22.

The commercial strain of the small gherkin (*Cucumis sativus*) was grown in 3 photoperiodic environments of 8, 12 and 16 hours. The cucumber belongs to a race that cannot be clearly classified as being long-day or short-day plants. The 8-hour day lengths gave maximal stem elongation and maximum staminate flower production on the basis of the total number of flowers produced. The 16-hour day retarded stem elongation. Contrasted vegetative response to day length became especially evident with the onset of flowering, suggesting that the photoperiodic reaction of the stem is in some manner physiologically related to, if not dependent on, the onset of flowering itself. Quantitative measurements of growth of stem leaf and root as well as composition of chemical composition showed that vegetative growth peculiar to each day length occurred. [From author's summary.]

713. BROWN, F. C. 635.64
Dwarf and bush tomatoes.
J. roy. hort. Soc., 1945, **70**: 81-3.

Varieties of dwarf and bush tomatoes were grown at Wisley and compared with each other and with normal types. The yields of ripe fruit of the dwarfs were always less than those of the normal types. Of the dwarfs Bison, Dwarf Gem and Rosebush require pruning, disbudding and some

support and are best restricted to 4 main growths, stopping at the 2nd or 3rd truss and removing all side growths. Early Chatham and Victor require a 2-foot stake, no stopping and but little disbudding. Stambovoi, First in the Field, Lilliput and Premier should be restricted to one stem and be treated in a similar way to outdoor varieties. Selection in the Farthest North, a variety of Canadian origin, is not suitable for England.

714. PHILLIPS, H. J. 635.64
Trials of outdoor tomatoes in Northamptonshire.
Gdnrs' Chron., 1945, **117**: 104.

A note on that part of the national tomato trials which was carried out at the Northamptonshire Institute of Agriculture, Moulton, 1941-44. Examination of results was based on the numbers of ripe fruits picked by 30 September and speed and earliness of ripening. Much saving of labour and uniform treatment for all was obtained in 1944, by eliminating the pricking out stage and potting direct from the seed box into 3½ inch pots when the seeds had just germinated with the cotyledons not fully developed. The light soil and dry weather made for a light crop. Manurial treatment was 10 tons per acre of farmyard manure, plus 1 cwt. each sulphate of ammonia, superphosphate and muriate of potash before planting, followed by a top dressing of 1 cwt. superphosphate and 1 cwt. muriate of potash when the first truss was swelling. Fortnightly spraying was done against potato blight from July to mid-September. General results: Hundredfold, Harbinger, Radio and Market King are reliable and ripen early. In spacing trial plots in 1942 double rows of single-stemmed plants (i.e. pairs of rows spaced ½ ft. between plants and alternately 1½ ft. and 3 ft. between rows, the plants of the narrow rows being tied to a single wire between them) gave significantly greater yields of ripe fruit than single rows, 3 ft. × 1½ ft., Radio and Market King being the test varieties. In 1943 spacing trials the double row single stem system proved superior in yield to single stemmed plants in single rows as before, 2-stemmed rows, 3 ft. × 2 ft., and 3-stemmed rows, 3 ft. × 3 ft. In both the latter cases fruit ripened slowly and there was much green fruit at the end of the season. The double row method has been adopted as the standard practice at Moulton. The dwarf and bush varieties could not compare in yield with the standard tall varieties. Dwarf Stambovoi and tall Radio were compared for frost resistance as single stemmed plants; both largely resisted 6° F. of frost and were blackened at 8° F. In this trial Stambovoi gave a yield equal to Radio and may be of use as a single stem plant in the Moulton district.

715. DU FEU, S. H. 635.64
Spacing of tomatos in cold houses.
Gdnrs' Chron., 1945, **117**: 112.

Close planting of tomatoes in greenhouses produced a lower poundage per plant than in the case of wide spacing, but the yield from the extra plants more than compensated for the decrease. The results for a number of houses are tabulated.

716. POLLARD, L. H., AND PETERSON, H. B. 635.64
A suggested use of a yellow-fruited tomato variety as a border for fertilizer or variety trials of red-fruited tomatoes.
J. Amer. Soc. Agron., 1945, **37**: 241.

It is recommended that a yellow-fruited tomato variety should be used as a border for fertilizer or variety trials of red-fruited tomatoes in order to eliminate a common source of error with pickers.

717. MEURMAN, O. 635.64: 612.014.44
The significance of neon light for greenhouse cultures. III. Experimental results with tomatoes. [German.]
Valt. Maatalousk. Aika, 1944, **16**: 127-43, from abstract *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 189-91.

The experimental results obtained at Piikkiö in 1935-37 showed that the use of neon light for the production of early greenhouse tomatoes is profitable under Finnish conditions. Plants sown 30 November and 14 December were illuminated 8 hours per night for 30 and 60 nights by bulbs of the type Philips No. 4310 with an intensity of 1,000-800 Lux at a night temperature of at least 15-16° C. The distance from the source of light was about 1 m. The illuminated plants were much bigger, flowered and cropped earlier and gave a higher percentage of saleable fruit than the controls. The best results were obtained with the first sowing where the increase in yield amounted to 152% and 157·5% and the increase in returns to 197·1% and 212·8% respectively for plants illuminated for 30 and 60 nights. Another trial suggested that 10-12 hours of artificial light per night may be preferable to 8 hours. It is emphasized that the light should be applied as soon as the seedlings emerge.

718. MCCOLLUM, J. P. 635.64: 577.16
Some factors affecting the ascorbic acid content of tomatoes.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 382-6.

The salient results from these investigations at Urbana, Ill. are that no consistent relationship could be established between ascorbic acid content and total solids and sugar content, and that fruits from defoliated plants, thus exposed to sunlight, may be higher in ascorbic acid than plants with normal foliage.

719. BONNER, J. 635.64: 631.542.24: 581.192
Accumulation of various substances in girdled stem of tomato plants.
Amer. J. Bot., 1944, **31**: 551-5, bibl. 8.

The following substances were found to be accumulated to various extents and at varying rates in tomato stems in which transport was interrupted by girdling: Thiamine, pyridoxine, pantothenic acid, riboflavin, sucrose, total nitrogen and non-protein nitrogen. It is held that these results do not offer a clue as to whether these substances are transported in a single stream or mass flow.

720. HENDERSON, J. H. M., AND STAUFFER, J. F. 635.64: 581.144.2
The influence of some respiratory inhibitors and intermediates on growth and respiration of excised tomato roots.
Amer. J. Bot., 1944, **31**: 528-35, bibl. 21.

In trials at the University of Wisconsin excised root tips of tomato were grown in mineral nutrient solution containing sucrose, vitamins B_1, B_6 and nicotinic acid. A series of substances proposed as respiratory intermediates were used in studying the rate of oxygen uptake of young tomato roots. These were fumarate, malate, succinate, citrate, oxalacetate, and pyruvate. The substances produced the most consistent and accelerating rates of oxygen uptake when employed at 0·001 M concentration. Experiments were carried out employing the following substances as enzyme inhibitors: malonate, fluoride, azide, cyanide, and iodoacetate. The data indicate that there is no malonate-sensitive system in young tomato roots. The same is true for fluoride. There is an azide- and cyanide-sensitivity which suggests the cytochrome system. The results very definitely indicate the presence of an iodoacetate-sensitive system. In general, it was impossible to restore the rate of oxygen uptake of inhibited roots by adding a single intermediate or a combination of intermediates. The data suggest that a modified Krebs' " tricarboxylic acid cycle " may function in the respiration of intact tomato roots. [From authors' summary.]

721. ZIMMERMAN, P. W., AND HITCHCOCK, A. E. 577.15.04: 635.64: 581.145
Substances* effective for increasing fruit set and inducing seedless tomatoes.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 353-61, bibl. 12.

Out of a large number of substituted phenoxy acids, indole

* See also 423.

and naphthoxy compounds and substituted benzoic acids tested at the Boyce Thompson Institute and found to be successful in inducing seedless tomatoes, four, namely 2-chlorophenoxypropionic acid, 2,4-dichlorophenoxyacetic acid, 2,5-dichlorobenzoic acid and β-naphthoxyacetic acid proved particularly effective. All can be applied as a water solution without a spreader. It is essential to find the minimum effective concentration for each variety and keep to this, since the higher concentrations are liable to cause inhibition of growth, modification of shape and loss of the smaller buds. An atomizer can be used and the spray should be applied to the peduncles, to the back of the buds and flowers and to the open side of flowers. It is likely that the aerosol method of application, here illustrated, will become more important in future.

722. Murneek, A. E., Wittwer, S. H., and Hemphill, D. D. 635.64: 577.15.04
Supplementary hormone sprays for greenhouse-grown tomatoes.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 371-81, bibl. 11.

The authors summarize the results of their experiments at Columbia, Mo, in the years 1941/2, 1942/3 and 1943/4 on Marglobe tomato plants and discuss other work already published in this field. It seems certain that tomato fruit set and size can be improved by the application of certain growth substances, especially under conditions of subnormal light and temperature. Among the most successful chemicals used are β-naphthoxyacetic acid (NOA) and the chlorophenoxyacetic acids (ClPA and Cl_2PA). Not only is the fruit increased in number and size but it also tends to become more uniform in size and weight.

723. Beckenbach, J. R. 635.64: 632.811.9: 546.27
Functional relationships between boron and various anions in the nutrition of the tomato.
Bull. Fla agric. Exp. Stat. **395**, 1944, pp. 34, bibl. 15.

A set of tomato plants (variety Rutgers) was grown in pure quartz sand culture by the constant drip method. By use of a factorial split-plot design and the analysis of variance, the data showed significant interactions interpreted as follows: 1. *Between nitrate level and boron requirement.* Plants grown with solutions containing ample nitrates required many times more boron than did nitrate-starved plants. This information was interpreted as being in support of the theory that boron is functional in normal protein metabolism, probably through a direct effect on carbohydrate utilization in normal metabolic processes. 2. *Between phosphate level and boron requirement.* Plants grown with solutions deficient in phosphates require more boron than do plants receiving ample phosphates. The theory is presented that the phosphate and borate ions may function interchangeably as essential juice buffers, or in precipitating out excess cations which form relatively insoluble salts with these ions, or in both of these functions. With relation to the boron-phosphate relationship found, this would indicate that boron deficiency might be expected to limit growth on soils naturally low in phosphate. This might be expected regardless of nitrogen and potash levels. [From author's summary.]

724. Breon, W. S., and Gillam, W. S. 635.64: 631.8
Influence of phosphorus supply and the form of available nitrogen on the nitrogen metabolism of the tomato plant.
Plant Physiol., 1944, **19**: 649-59, bibl. 14.

From experiments described, and carried out at Purdue University Experiment Station, U.S.A., it is concluded that the importance of phosphorus in regulating the nitrogen metabolism of the tomato plant has been over-emphasized.

725. Larson, R. E., and Marchant, W. L. 635.64: 631.4
The response of three F_1 lines and ten strains of tomatoes to two distinct soil types.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 341-7, bibl. 5.

F_1 lines and inbred strains did not respond similarly to two soil types.

726. Hopkins, J. C. F. 635.64: 632.3/4+632.8
Diseases of fruit, flowers and vegetables in Southern Rhodesia. 9. Diseases of tomatoes.
Rhod. agric. J., 1945, **42**: 81-7, bibl. 6.

Southern Rhodesia has been remarkably free from tomato diseases, but growers are urged to apply fungicidal sprays during the wet months of December, January and February. The more important diseases and their control are described and illustrated.

727. Davis, B. H., and Haenseler, N. J. 635.64: 631.531.17
Tomato seed treatment with New Improved Ceresan dust.
Phytopathology, 1944, **34**: 847-8, being *J. Ser. Pap. N.J. agric. Exp. Stat.*

Tomato seed treatment with 0·5% New Improved Ceresan dust, by weight of seed, applied by means of a commercial machine duster, resulted in 98-100% clean seed with no apparent injury.

728. Raleigh, S. M., and Chucka, J. A. 635.64: 631.8: 632.19
Effect of nutrient ratio and concentration on growth and composition of tomato plants and on the occurrence of blossom-end rot of the fruit.
Plant Physiol., 1944, **19**: 671-8, bibl. 3.

At the Department of Agronomy, Maine University, Marglobe tomatoes were grown out of doors with subirrigation methods, using widely different nutrient ratios. The increase of an element in the nutrient solution tended to its increase in all parts of the plant including the fruit and the increase of certain elements (e.g. potassium) tended to a decrease in certain other elements (e.g. nitrogen). Variation in the nutrient solution affected the composition of the fruit much less than it did the composition of either the vines or roots of the plants. The climatic conditions in which the plants were grown, rather high humidity and relatively cool days, were not particularly favourable to blossom-end rot and the percentages were low. Blossom-end rot was produced when the solutions were high in either sulphur, magnesium, potassium or chlorine or low in calcium. It was produced at relatively low osmotic values from which it is concluded that osmotic values play no part in its incidence. Plants producing fruits with less than 0·20% Ca content generally showed some blossom end rot.

729. Thomas, W., and Mack, W. B. 635.64: 632.19: 581.192
A foliar diagnosis study of the nutrition of greenhouse tomatoes in relation to the incidence of a disease.
Bull. Pa agric. Exp. Stat. **405**, 1941, pp. 17, bibl. 12.

The incidence of streak in connexion with nutrition has already been discussed by the authors, *Proc. Amer. Soc. hort. Sci.*, **39**: 319-28; *H.A.*, 12: 512. In the same experiment with differentially fertilized tomatoes grown under greenhouse conditions, plants on certain plots which received different combinations of commercial fertilizers without manure additions showed more or less marked symptoms of breakdown characteristic of infection by *Fusarium lycopersici* Sacc., whereas plants growing on other plots, notably those which received manure in addition to commercial fertilizers, did not become diseased. Experimental data are discussed at considerable length and evidence

is given that susceptibility to disease in the plants was related principally to nutritional disequilibrium between the plastic elements, nitrogen, phosphoric acid, and potash.

730. SELMAN, I. W. 635.64: 632.8
Virus infection and water loss in tomato foliage.
J. Pomol., 1945, **21**: 146-54, bibl. 8.
Marked increases in transpiration occurred in 1-3 days in tomato leaflets inoculated with spotted wilt, tobacco mosaic or tomato yellow mosaic at Cheshunt Research Station. Transpiration methods might prove useful in revealing the presence of a virus when symptoms in the indicator plants may be long delayed. Older leaves showed the greatest increase in water loss and inoculation of the upper leaf surface increased transpiration on both upper and lower surfaces.

731. VASUDEVA, B. S., AND LAL, T. B. 635.64: 632.8
Big bud disease of the tomato.
Ind. J. agric. Sci., 1944, **14**: 160-2, bibl. 5.
In the course of a study on tomato virus diseases, conducted at the Imperial Agricultural Research Institute, New Delhi, big bud (*Lycopersicum virus 5*) was encountered for the first time in India. The symptoms are described and clearly illustrated.

732. HENDERSON, R. G. 635.64: 632.411
Further testing of copper fungicides for control of tomato blight in Southwest Virginia.
Phytopathology, 1945, **35**: 120-8, bibl. 7, being *Pap. Va agric. Exp. Stat.* **122.**
Cuprous oxide dust proved superior to tribasic copper sulphate in the control of early blight, late blight and *Septoria* leaf spot of tomatoes in the field and in the control of early blight in the greenhouse, where *Alternaria solani* was the sole test fungus. The use of cuprous oxide dust can also be recommended as containing less metallic copper than tribasic copper sulphate. Under the dry conditions of August and September 1943, side applications of nitrate of soda were found to depress yields.

733. SIMONDS, A. O., AND KREUTZER, W. A. 635.64: 632.411
Infection phenomena in tomato-fruit rot caused by *Phytophthora capsici*.
Phytopathology, 1944, **34**: 813-7, bibl. 4, being *Pap. Sci. J. Ser. Colo agric. Exp. Stat.* **184.**
Observations showed that infection of tomato fruits by *Phytophthora capsici* occurs more readily through the stylar end than through the stem end. The different susceptibility is thought to be connected with the content of numerous crystals in the stem end tissue. Hyphal development was stopped and the characteristic watery breakdown did not result in the presence of the crystals. There were no crystals in the tissue of the stylar end.

734. KREUTZER, W. A., AND BRYANT, L. R. 635.64: 632.411
A method of producing an epiphytotic of tomato fruit rot in the field.
Phytopathology, 1944, **34**: 845-7, being *Pap. sci. J. Ser. Colo agric. Exp. Stat.* **182.**
A method of effectively infecting tomato fruits with *Phytophthora capsici* on a field scale was devised as a preliminary to testing fungicides for the control of the disease, which is the cause of heavy losses in the canning areas of Colorado.

735. CRANE, M. B. 635.64: 632.48
Inheritance of resistance to leaf-mould in tomatos.
Gdnrs' Chron., 1945, **117**: 123.
A note on recent investigations at the John Innes Horticultural Institution in breeding tomato varieties resistant to *Cladosporium fulvum*.

736. CLARKE, E. J., AND SHERRARD, G. O. 635.64: 632.4
A leaf-spot on tomatoes and its relationship to the variety Vetomold.
Gdnrs' Chron., 1945, **117**: 71.
In Ireland the Vetomold tomato introduced from Canada in 1940 as immune to *Cladosporium* leaf-mould has shown many disappointing features, such as lack of vigour, low yield and misshapen fruit, nor is its immunity to *Cladosporium* universal. Many heavy cropping susceptibles, such as Scarlet Knight, although heavily infested, will yield almost double. Vetomold has proved a disappointing parent and in breeding work at the Albert Agricultural College, Dublin, has developed a serious constitutional weakness in the form of peculiar leaf spotting which appears in the F_2 generation, the ratio of infected to non-infected plants being about 3: 1. The disease can be very destructive, in severe cases drastically reducing yield. Faint yellow-green, smallish spots appear first and later enlarge and often coalesce to form a large central red brown necrotic area providing a contrast with the yellow-green zone immediately surrounding it. Its origin is thought to be constitutional for reasons which are given. The Canadian All Red has also proved to be a parent communicating a similar leaf spot in the F_2 generation when crossed with ordinary commercial varieties, and so has a very vigorous, non-commercial, resistant strain introduced in 1937 from the State College, Massachusetts. The leaf spot has appeared in a number of commercial tomato houses in the Dublin district and in all cases the infected plants were second generation plants of a Vetomold cross with standard commercial varieties.

737. ANDRUS, C. F., AND REYNARD, G. B. 635.64: 632.48
Resistance to *Septoria* leaf spot and its inheritance in tomatoes.
Phytopathology, 1945, **35**: 16-24, bibl. 9, being *Contr. U.S. Veget. Breed. Lab., Charleston, S.C.*, **42.**
All commercial tomato varieties (127) tested proved highly susceptible to *Septoria lycopersici*. Out of 267 foreign accessions of *Lycopersicum*, 12, showing indications of an outcrossing with wild types, possessed some degree of resistance, which is characterized by rather small lesions without or with only few pycnidia. Experiments on the inheritance of resistance to leaf-spot in tomatoes are reported.

738. MCKAY, R. 635.64: 632.48
Outbreaks of verticillium wilt in newly-erected glasshouses.
Gdnrs' Chron., 1945, **117**: 24, bibl. 1.
The Department of Plant Pathology, Dublin University, was called upon to investigate outbreaks of verticillium wilt on tomato plants in houses newly erected on a rhubarb plantation. Infection was traced to the rhubarb stools, which in two cases had not been removed until after the houses were put up. In the third the stools had been removed but the top soil that had contained them had been carried to one end of the house for levelling purposes. At this end infection was 75%; at the end from which the top soil had been cleared it was only 2%. The discovery is of importance since rhubarb is occasionally forced in tomato houses and pieces easily break off and may get into the soil. Rhubarb may be attacked by this disease without showing much injury, thus infected stools would escape notice. Wormald appears to have been the only one of many investigators of verticillium wilt to record its occurrence on rhubarb (*A.R. East Malling Res. Stat. 1926-7, II, Suppl.*, pp. 75-88, 1928).

739. YOUNKIN, S. G., AND DIMOCK, A. W. 635.64: 632.48
Foliage infection of *Lycopersicon esculentum* by *Colletotrichum phomoides*.
Phytopathology, 1944, **34**: 976-7, bibl. 2.
The effect of inoculations with the anthracnose fungus upon tomato leaves is described.

740. FRIEND, A. H. 635.64: 632.654.2+632.78
Treatment of unstaked tomato crops. Economic control of mite and caterpillars demonstrated.
Agric. Gaz. N.S.W., 1944, **55**: 424-5.
Dusting unstaked tomatoes for control of the tomato mite, *Phyllocoptes lycopersici*, with a mixture of equal parts by weight of sulphur and hydrated lime, 3 times, at intervals of 3 weeks commencing at flowering, resulted in a yield of 6·70 tons per acre as against 3·75 tons in the controls. This shows that dusting is a profitable measure even when delayed until the first symptoms of mite attack occur. Although mites are the chief pest of unstaked tomatoes in the Hawkesbury and Nepean flats of New South Wales, the trials carried out on a farm at Cranbrook further proved that an addition of lead arsenate to the mixture for the control of potato or tomato caterpillars is economically advantageous and that the first application should be made in the seedbed, one week before transplanting. In a dry season a bordeaux treatment is unnecessary.

741. STARK, F. L., Jr., LEAR, B., AND NEWHALL, A. G. 632.651.3: 632.944
Comparison of soil fumigants for the control of the root-knot nematode.
Phytopathology, 1944, **34**: 954-65, bibl. 10.
In trials at Ithaca the efficiency of several soil fumigants against *Heterodera marioni* was compared with that of chloropicrin in two commercial tomato greenhouses. While confirmation was obtained that chloropicrin controls a wider range of soil pests and diseases than any of the chemicals tested, a 10% methyl bromide mixture in particular showed certain advantages over chloropicrin, if the control of nematodes is the primary purpose. This chemical appears to penetrate unrotted roots and allows of early replanting after treatment. The testing of a two-row, continuous flow, power-driven type of injector in comparison with hand-operated injectors is in progress.

742. RIGG, T., KIDSON, E. B., AND CHITTENDEN, E. T. 635.64: 632.944
The effects of steam and soil disinfectants on the yield and quality of Nelson tomatoes under outside culture.
N.Z. J. Sci. Tech., 1944, **26**, Sec. A., pp. 183-6.
Steam or formalin treatment of outdoor soil at the Cawthron Institute, Nelson, resulted in a 25% increase in yield of the Potentate tomatoes subsequently grown. There was a reduction in the amount of hard core, most marked in the case of the formalin treatment. A 3 oz. per sq. yd. bleaching powder treatment was harmful. The steam treatment was applied to a depth of 14 in., using a steam grid at a pressure of 100 lb. to the sq. in. The formalin application consisted of ½ gal. of 40% formalin per sq. yd. diluted with 2 gal. water and used in 2 applications, half on the lower spit and half on the top 4 in., which was temporarily removed for the lower spit to be treated.

743. BEAMES, G. H., AND BUTTERFIELD, N. W. 632.944: 635.64
Some physiological effects of methyl bromide upon horticultural plants.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 318-22, bibl. 2.
Fumigation with methyl bromide vapour greatly checked the growth of young tomato seedlings. There are strong indications that wilting was due to reduction of oxygen in the soil caused by the action of the heavier than air methyl bromide vapour.

744. WAGER, V. A. 635.646: 632.3
Bacterial wilt of the egg-plant.
Fmg S. Afr., 1944, **19**: 661-4.
The bacterial wilt disease of egg plants, caused by *Bacterium solanacearum*, is described. Of a number of reportedly resistant varieties introduced from Puerto Rico, Ceylon and Java only the two Javanese varieties, Matale and Kopak, showed a high degree of resistance when tested under South African conditions at Durban, the latter more so than the former. Further tests and selection work are in progress.

745. WHITMORE, R. A. 635.65: 612.014.44: 581.175.11
Light and pigment development in the kidney bean.
Plant Physiol., 1944, **19**: 569-78, bibl. 10.
The paper is one of a series from Chicago University on the effects of low light intensity on plant growth. Red kidney bean seedlings were grown in gravel in tap water under monochromatic illumination and in darkness. Plants grown in red light showed maximum loss of weight and calculation of dry weight ratios indicated maximum translocation of reserve material and a higher proportion translocated to the roots than in the case of plants from under green and blue lights. Plants grown in blue light showed a minimum loss of weight. Loss of weight in plants grown in green light was equal to that of plants grown in darkness. On a fresh weight basis the maximum amount of chlorophyll and carotene was developed by plants under green light, and of carotenol in plants grown in darkness and in red light. The minimum chlorophyll and carotenol was developed in the blue plots, the minimum carotene in the red. On a basis of total pigment developed per 80 plants per plot maximum chlorophyll and carotenol were produced by the red plot and carotene by the green plot. Excluding the dark plot from chlorophyll comparisons minimum chlorophyll and carotenol was found in the blue plot and minimum carotene in the dark, being about one-third as much as in the green plot.

746. WADLEIGH, C. H., AND AYERS, A. D. 635.65: 631.432: 581.192
Growth and biochemical composition of bean plants as conditioned by soil moisture, tension and salt concentration.
Plant Physiol., 1945, **20**: 106-32, bibl. 64.
At the U.S. Regional Salinity Laboratory, Riverside, Calif., 36 cultures of dwarf kidney beans were grown at three moisture tensions in containers filled with loam to which nil, 0·1, 0·2 and 0·4% of sodium chloride (dry soil basis) were added. Some of the results obtained are summarized by the authors as follows: "Progressive additions of sodium chloride to the soil caused progressive decreases in growth and yield of beans. Increasing soil moisture tension or salt concentration tended to cause an increase in the percentage of nitrate nitrogen in the plants, and to have a similar effect, though less pronounced, on the percentage of soluble, organic nitrogen. Consequently, increasing intensity of either type of stress tended to cause an increase in nitrate/soluble-organic-N ratio. The percentage of protein in the leaves increased with increased intensity of either type of stress. The relative effects of salt concentration and soil moisture tension on water availability to these plants is discussed. It is concluded that growth reductions were to a large extent brought about by reduced hydration of protoplasmic proteins, whether water stress was due to osmotic forces or to moisture tension, since adequate percentages of proteinaceous constituents were present for higher rates of meristematic activity. It is suggested that factors other than varying degrees of water availability were operative in conditioning these plants. The data indicate that excessive concentrations of the chloride ion *per se* affect carbohydrate metabolism, possibly through reduced photosynthetic activity. It is concluded that the hyperbolic nature of the relationship between soil moisture percentage and moisture tension accounts for the frequent finding that for all practical purposes plants may not show changes in growth response while reducing the moisture percentage of soil from field capacity to nearly the wilting percentage."

747. Zuck, R. K. 635.65: 577.15.04
Effects of fluorescein and Photosensin on growth of red kidney beans.
Bot. Gaz., 1944, **106**: 124-9, bibl. 8.
It is shown that fluorescein has neither a stimulating nor a stunting effect on growth as was claimed by workers who had applied the chemical in Photosensin. The alleged effects were found to be due to other constituents in this commercial preparation, when a re-investigation was made at Beltsville, Maryland.

748. Hardenburg, E. V. 635.65: 577.15.04
Effect of hormone dusts on pod-set and yield in beans.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 367-70, bibl. 4.
In experiments in Ithaca dusting seed beans with one proprietary hormone did not have any beneficial result on seedling production nor did the use of another similar product at blossoming time result in increased seed production. The reason for these negative results is discussed.

749. Schultz, H. 635.655: 632.4
Untersuchungen über die Fusskrankheit der Ackerbohne. **(Foot rot of beans.)**
Zbl. Bakt., IIte Abt., 1943, **106**: 38-50, bibl. 17.
The discussion on the symptoms, significance and distribution of the foot rot disease of beans is based partly on the literature and partly on the author's own research. The pathogenicity of numerous strains of the following fungi was determined by means of inoculation experiments in the greenhouse and in the field: *Rhizoctonia solani*, *Pythium de baryanum*, *P. ultimum*, *P. irregulare* and *Fusarium avenaceum*. Some strains of *Rhizoctonia* and *Fusarium* were found to cause great damage to beans, while all *Pythium* strains tested proved only mildly pathogenic.

750. Cunningham, H. S. 635.653: 631.531.17
Lima bean seed treatment on Long Island.
Phytopathology, 1944, **34**: 790-8, bibl. 3, being *J. Pap. N.Y. St. agric. Exp. Stat.* **589.**
Seed treatment of lima beans improved the stand only within a narrow range of specified climatic conditions and is, therefore, not recommended to Long Island growers.

751. Harris, M. R., and Ellet, C. W. 635.655: 632.4
A *Penicillium* disease of soybean.
Phytopathology, 1945, **35**: 144-5.
Two types of lesion on germinating soybean seedlings are described which were proved to be caused by an unidentified *Penicillium* species. The percentage of infection under field conditions is being studied by the Ohio Seed Improvement Association.

752. Tervet, I. W. 635.655: 632.4
The influence of fungi on storage, on seed viability and seedling vigor of soybeans.
Phytopathology, 1945, **35**: 3-15, bibl. 10; being *Pap. sci. J. Ser. Minn. Agric. Exp. Stat.* **2161.**
In Central and Southern Minnesota *Alternaria* spp. were the fungi occurring most frequently on soybean seeds as revealed by a survey of their microflora undertaken at University Farm, St. Paul. Frost injury was found to increase the percentage of infected seeds. Loss of viability in uninjured seeds was mainly due to *Aspergillus* spp., which are responsible for much of the heating in stored seed. These fungi throve best in seeds with a high moisture content (above 13%) and at a temperature of 45° C., causing a decrease in seedling vigour. No infection occurred at 60° C. Seed disinfection and the provision of conditions unfavourable to the development of *Aspergillus* are the author's recommendations for soybean storage.

753. Dawson, C. D. R. 635.67(42)
Sweet corn in England.
J. roy. hort. Soc., 1945, **70**: 111-9, bibl. 7.
An account of the breeding of a sweet corn suitable for growth in England. The work is in progress at the John Innes Institution and considerable success has been attained. The sweet corn is much affected by local climatic conditions, thus American corns are usually unsuitable. There is confusion between genuine sweet corns and other types of maize which are hard-seeded and starchy, and disappointment is often caused by the use of the wrong kind. Seed in England can be sown out of doors in mid-May or in pots in a cold frame for planting out at the end of May. There is a note on pests and diseases, which are few in England, the most troublesome being the frit fly.

754. Treschow, C. 635.8
Nutrition of the cultivated mushroom. [English.]
E. Munksgaard Bogforl., Copenhagen, 1944, pp. 190, from review *Sverig. pomol. Fören. Årsskr.*, 1944, **45**: 187-9.
The following are among the chief results obtained in a study of *Psalliota bispora* f. *avellanea* and f. *albida*, which was carried out at the Veterinary and Agricultural College, Copenhagen. The mycelium was found to grow at a temperature-range of 3°-33° C. and a pH-range of 4·4-9, the optima being 24° C. and pH 6·8-6·9. Nutritional experiments showed, among other things, that calcium was indispensable, that an interesting interaction existed between calcium, potash and magnesium and that sensitivity to phosphate partly depended on the pH value of the medium. Addition of the trace elements zinc, manganese and copper had no effect, but small amounts of iron proved very stimulating. The best source of carbon was xylan, hemicellulose was preferred to cellulose and lignin. Aspartic and glutamic acid were the optimum sources of nitrogen, nitrates could not be utilized. The addition of a hormone to the synthetic medium was necessary, extracts of stinging nettle or alfalfa leaves being particularly effective. The production of fruit bodies was studied in jars by means of a special technique. Yields were considerably increased by adding a preparation of vitamin B or the growth substance aneurin to the horse manure serving as medium. It was further discovered that the traditional horse manure could be successfully substituted by withered but not yet decayed needles collected from the top soil of a fir wood. The pH value of the medium was raised from about 4 to 7-8 by adding calcium carbonate. An appropriate amount of water was added and the substratum was pasteurized at 80° C. for 20 minutes.

755. Vasiljkov, B. P. 635.8
The systematics of *Boletus versipellis* Fr. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 21-7.
This large edible mushroom, which, according to an old recipe, should be preserved by drying rather than salting, occurs in four mycorrhizal forms, thus raising some difficulty in classification. *B. versipellis aurantiacus* grows in symbiotic association with *Populus* spp., the form *B. rufescens* with the birch, *B. ericetorum* with pines, and *B. arcticus* with the dwarf birch.

756. Treschow, C. 635.8: 632.4
Bekämpfung von *Mycogone* in Champignonkulturen. **(The control of *Mycogone* in mushroom cultures.)**
Zbl. Bakt. IIte Abt., 1943, **105**: 418-21, bibl. 14.
At the Veterinary and Agricultural College, Copenhagen, a 1: 1: 50 lime-copper solution applied once or twice between the emergence of fruit bodies at the rate of 1 litre per m.^{2} was found to give excellent control of *Mycogone perniciosa* in mushroom beds, the percentage of destroyed fruit bodies being reduced to 3-5% from 90-100% in the controls. The chemical, in contrast to fruit tree carbolineum

which is also effective against the disease, has no harmful effect on the mushrooms.

757. DAVIS, A. C. 635.8-2.654.2
The mushroom mite (*Tyrophagus lintneri* (Osborn)) as a pest of cultivated mushrooms.
Tech. Bull. U.S. Dep. Agric. **879**, 1944, pp. 26, bibl. 25.
After describing the injuries to cultivated mushrooms caused by the mushroom mite and the life history of the pest, the author discusses preventive and control measures. Particular importance is attached to sanitation, which should begin in the stables where the manure is obtained, since it is easier to prevent the development of an infestation than to control it once established. Detailed instructions are given. Of the fumigants tested for treating the compost at peak heat before mushrooms are present hydrocyanic acid gas and sulphur dioxide proved most effective. Applied as insecticidal dusts or drenches in specified amounts only the following materials have given good results: nicotine, pyrethrum, methyl salicylate and dichlorethyl ether. Thermal treatments, such as the use of boiling water, flame or live steam in the mushroom beds between flushes are briefly dealt with.

758. ANGELO, J. S. 633.87
(45) Substâncias tanantes. Determinação da acidez dos liquidos curtientes. **(Determination of the tannin content of 147 plants, grown in and the majority native to Brazil.)**
Publ. Serv. Inform. agric., Rio de J. (S.I.A.), unnumbered, 1942, pp. 10, reprinted from Anais do 3° Congr. Sul. Amer. de Quimica, 9° Secção.

ASKEW, H. O., AND BLECK, R. T. J. 633.71: 581.192
Flue-cured tobacco. I. Changes in weight of leaf during curing.
N.Z. J. Sci. Tech., 1944, **26**, Sec. A, pp. 171-82, bibl. 3.

BEALE, H. P., AND LOJKIN, M. E. 633.71-2.8
Quantitative studies on the precipitin reaction of the tobacco-mosaic virus-antiserum system.
Contr. Boyce Thompson Inst., 1944, **13**: 385-410, bibl. 45.

BROOKS, A. N. 635.53: 632.4
Control of celery pink rot [*Sclerotinia sclerotiorum*].
Pr. Bull. Fla agric. Exp. Stat. **567**, 1942, pp. 4.

COLE, C. E., HARPER, R. S., AND MULLET, Z. A. 635.64: 631.523
Tomato variety investigations in the Goulburn Valley—1943-44.
J. Dep. Agric. Vict., 1944, **42**: 489-93.

CURRENCE, T. M., LAWSON, R. E., AND BROWN, R. M. 635.611
A rapid method for finding the volume and density of muskmelon fruits.
J. agric. Res., 1944, **68**: 427-40, being *Pap. sci. J. Ser. Minn. agric. Exp. Stat.* **1636.**

CURRENCE, T. M., LARSON, R. E., AND VIRTA, A. A. 635.64
A comparison of six tomato varieties as parents of F_1 lines resulting from the fifteen possible crosses.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 349-52, bibl. 3.

CURRIER, H. B. 635.11: 581.144.2
Water relations of root cells of *Beta vulgaris*.
Amer. J. Bot., 1944, **31**: 378-87, bibl. 38.

DEONIER, M. T., AND HOFFMAN, G. P. 635.31
Asparagus production in the lower south with special reference to time and length of cutting season.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 413-7, bibl. 8.
Not a commercial proposition.

EDDINS, A. H. 635.34: 632.411.4
Control of downy mildew [*Peronospora parasitica*] of cabbage with spergon and fermate.
Pr. Bull. Fla agric. Exp. Stat. **589**, 1943, pp. 4.

EDDINS, A. H. 633.491-2.3
Brown rot of solanaceous plants [*Bacterium solanacearum*].
Pr. Bull. Fla agric. Exp. Stat. **548**, 1940, pp. 4.

ELLIS, N. K., AND GAYLORD, F. C. 633.822
Relation of yield of oil from peppermint (*Mentha piperita*) and the free menthol content of the oil.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 451-4, bibl. 2.

GARBER, K. 633.527
Hagel- und Pilzschäden an Faserneselstengeln. **(Hail and fungus injury to the stems of fibre nettles.)**
Faserforschung, 1940, **15**: 38-40, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 73-4.

GRIFFITH, R. B., VALLEAU, W. D., AND JEFFREY, R. N. 633.71: 581.192
Chlorophyll and carotene content of eighteen tobacco varieties.
Plant Physiol., 1944, **19**: 689-93, bibl. 4.

GUADAGNIM, L. 633.842
Pimentão. **(Cultivation of capsicums in Brazil.)**
Ceres, 1943, **4**: 175-7.

HARRISON, A. L., AND BROOKS, A. N. 635.64: 632.3
Control of bacterial soft rot of tomatoes [*Erwinia aroideae*].
Pr. Bull. Fla agric. Exp. Stat. **592**, 1943, pp. 2.

HAWTHORNE, P. L. 635.615
A polyploid watermelon [at Calhoun, Louisiana].
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 348.

HESSLER, L. E. 633.522: 581.192
Chemical and strength differences in dew-retted hemp fiber.
J. Amer. Soc. Agron., 1945, **37**: 146-55, bibl. 5.

JANES, B. E. 635.34 + 635.65
The relative effect of variety and environment in determining the variations of per cent dry weight, ascorbic acid and carotene content of cabbage and beans.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 387-90, bibl. 4.

JEWETT, H. H. 633.71-2.76
Control of green June beetle larvae *Cotinis nitida* (L.) in tobacco beds.
Bull. Ky agric. Exp. Stat. **445**, 1943, pp. 10, bibl. 9.

KARIKKA, K. J., DUDGEON, L. T., AND HAUCK, H. M. 633.491: 577.16
Influence of variety, location, fertilizer, and storage on the ascorbic acid content of potatoes grown in New York State.
J. agric. Res., 1944, **68**: 49-63, bibl. 24.

LÖBBE, H. 635.655(81)
Cultura da soja no Brasil. **(Soya bean growing in Brazil.)**
Publ. Serv. Inform. agric. Rio de J. (S.I.A.) **143**, 1942, 6th edit., pp. 35.

LOJKIN, M. E., AND BEALE, H. P. 633.71-2.8
A colorimetric method for the quantitative determination of minute amounts of tobacco-mosaic virus and for differentiation between some of its strains.
Contr. Boyce Thompson Inst., 1944, **13**: 337-54, bibl. 20.

LOO, S.-W. 635.31: 631.535
Cultivation of excised stem tips of asparagus in vitro.
Amer. J. Bot., 1945, **32**: 13-7, bibl. 4.

MELIN, E., AND MIDEN, G. 635.8
***Morchella conica* Pers.—a fungus autotrophic towards aneurin.** [German.]
Svensk bot. Tidskr., 1941, **35**: 333-6, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 57.

MILLER, J. J. 635.611: 632.48
Studies on the *Fusarium* of muskmelon wilt. I. Pathogenic and cultural studies with particular reference to the cause and nature of variation in the causal organism.
Canad. J. Res.; 1945, **23**, Sec. C, pp. 16-43, bibl. 17.

MITRA, P. K. 633.656: 632.78
A note on *Heliothis armigera* Hubn., as a pest of pea (*Pisum sativum*).
Curr. Sci., 1944, **13**: 312-3, bibl. 4.

MYERS, C. H., AND FISHER, W. I. 635.34: 631.531
Experimental methods in cabbage breeding and seed production.
Mem. Cornell agric. Exp. Stat. **259**, 1944, pp. 29, bibl. 19.

PERSON, L. H. 635.65: 632.4
Parasitism of *Rhizoctonia solani* on beans.
Phytopathology, 1944, **34**: 1056-68, bibl. 19.

PETHERBRIDGE, F. R., AND JONES, F. G. W. 632.651.3: 633.41 + 633.63
Beet eelworm (*Heterodera schachtii* Schm.) in East Anglia, 1934-1943.
Ann. appl. Biol., 1944, **31**: 320-32, bibl. 11.

RAMSTAD, P. E., AND GEDDES, W. F. 664.84.655
The respiration and storage behaviour of soybeans.
Tech. Bull. Minn. agric. Exp. Stat. **156**, 1942, pp. 54, bibl. 45.

RATERA, E. L. 633.491
Observaciones sobre biologia floral de *Solanum chacoense* Bitter. **(Observations on the floral biology of a wild potato of Argentina.)** [10-line summaries in Spanish, English and Portuguese.]
Rev. Fac. Agron. B. Aires, 1943, **10**: 451-7, bibl. 17.

REYNARD, G. B., AND ANDRUS, C. F. 635.64: 632.4
Inheritance of resistance to the collar-rot phase of *Alternaria solani* in tomato.
Contr. U.S. Veget. Breed. Lab. Charleston, S.C., **41.**

REZENDE, A. 635.655(81)
Cultura da soja. **(Cultivation of soya beans in Brazil.)**
Ceres, 1942, **4**: 107-14.

SINNOTT, E. W. 635.61/2: 581.41
Cell polarity and the development of form in cucurbit fruits.
Amer. J. Bot., 1944, **31**: 388-91, bibl. 5.

STELZNER, G. 633.491-2.8
Zur Frage der Virusübertragung durch Samen, insbesondere des X-, Y- und Blattrollvirus der Kartoffel. **(Virus transmission by seed, with special reference to the X, Y and leaf-curl virus of the potato.)**
Züchter, 1942, **14**, 225, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 58-9.

THOMPSON, H. C. 635.53
Further studies on effect of temperature on initiation of flowering in celery.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 425-30, bibl. 5.

THORNTON, N. C. 633.491: 581.14
Dormancy, bud growth, and apical dominance regulated by oxygen in freshly-harvested potato tubers.
Contr. Boyce Thompson Inst., 1944, **13**: 361-6, bibl. 7.

TOBLER, F. 633.52-2.4
Flachsrost und Bastfaser. **(The effect of flax rust on fibre quality.)**
Faserforschung, 1941, **15**: 132-5, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 74.

TOWNSEND, G. R. 633.491-1.532.2
Relation of maturity in Bliss Triumph potato seed stocks to effectiveness of ethylene chlorhydrin and other treatments.
Tech. Bull. Fla agric. Exp. Stat. **362**, 1941, pp. 40, bibl. 43.

WATSON, J. R. 632.651.3
Mulch against root-knot [nematode spp.].
Pr. Bull. Fla agric. Exp. Stat. **586**, 1943, pp. 3.

WEBER, G. F. 633.842-2.4
Bacterial spot of peppers [*Phytomonas versicatorium*].
Pr, Bull. Fla agric. Exp. Stat. **549**, 1940, pp. 2.

WEBER, G. F. 635.65: 632.44
Web blight of beans [*Corticium microsclerotia*].
Pr. Bull. Fla agric. Exp. Stat. **550**, 1940, pp. 2.

WHITE-STEVENS, R. H., AND WESSELS, P. H. 635.1: 631.83/85: 546.27
Studies in the minor element nutrition of vegetable crop plants. I. The interrelation of nitrogen, phosphorus, potash and boron in the growth of rutabagas.
J. Amer. Soc. Agron., 1944, **36**: 903-21, bibl. 15, being *Pap. Dep. Veg. Crops Cornell Univ.* **220.**

WILMOT, R. J. 633.82(759)
Herbs for Florida.
Pr. Bull. Fla agric. Exp. Stat. **600**, 1944, pp. 3.

FLOWERS AND ORNAMENTALS.

759. RESENDE, F. 585.722(6)
Suculentas africanas III. **(Contribution to the study of the morphology, physiology and floral characteristics of certain African *Aloinae* grown in European botanic gardens.)** [French summary 4½ pp.]
Mem. Soc. broteria. **2**, 1943, pp. 119, bibl. 58.

The observations on some cultivated Aloinae recorded here are believed to be hitherto unpublished. When *Aloe ciliaris* and presumably others of the same genus germinate from seed the resulting plants form succulent roots. The succulence starts from the base of the root, but as growth proceeds these succulent masses become pushed away from the base. If the succulent roots are cut off the succeeding roots are not succulent, nor do plants grown from cuttings possess succulent roots. No explanation can be offered. *Haworthia* spp. form adventitious roots anywhere on the stem among the foliage. The roots have the same tropism as the leaves (e.g. they may grow upwards) until they are clear of the leaves, when they turn earthwards. If, however,

the root starts at some distance from the ground it dies off after making only short growth. Sometimes a root will grow through the parenchyma of a leaf and emerge at the tip and continue its functions or die off according to the distance from the soil. *Haworthia* and *Gasteria* require the aid of leaves for rooting, but in *Aloe* cuttings of the bare stem will root. Given the same photoperiod plants grown out of doors (*Haworthia* and *Aloe*) are larger and more succulent than those under glass. Both conditions are compatible with flowering except in the case of *Haworthia linifolia* var. *schuldteana* in which flowering is correlated with a great reduction of succulence. *Aloe bulbilifera* is the only one out of a thousand species known in which the power to produce flowers and bulbils on the same floral axis without detriment to the development of either is of genetic origin, though some species can do it accidentally from causes not determined. The transformation of a supposed flower stem into a stalk with a fully developed young plant on the end (*Gasteria* spp.) is discussed and illustrated, it is believed for the first time. The cause of the sudden change is unknown but it seems only to occur in very old or very young plants (i.e. they are too weak to carry out the full process of flowering). The fact that the flower stem stops growing as soon as the tip begins to vegetate is attributed to the absence of growth hormones, which otherwise would be supplied by the developing floral parts. Contrary to statements by others, environment has a considerable effect on self-sterility and successful cross pollination in *Gasteria* and in *Haworthia*. The *Aloinae* are so greatly influenced in form, shape, colour, arrangement of leaves on the stem and in many other ways by conditions of light and temperature as to present considerable difficulty to systematists. Propagation of *Aloinae* by stem cuttings is very easy, but so far *Gasteria* seems to be the only genus of this sub-family that will regenerate from the leaf alone.

760. Crevasse, J. M., Jr. 635.9(759)
Ground covers for Florida gardens.
Bull. Fla agric. Exp. Stat. **364**, 1941, pp. 60.
Following introductory remarks on climatic adaptations, propagation, cultural methods, soil adaptations, light requirements and desirable characteristics of ground covers for Florida gardens, suitable species and varieties are described in alphabetical order. The bulletin is well illustrated.

761. Kapadia, G. A. 586.352: 631.535
Anomalous vegetative reproduction by cuttings in *Ficus religiosa*, Linn.
Curr. Sci., 1945, **14**: 23, bibl. 2.
Out of a number of cuttings of *Ficus religiosa*—used as a support for climbing plants—made at Bahauddin College, Junagadh, one was observed to give rise to adventitious roots from one of the cut ends while lying on the ground. Further particulars of the varied behaviour of cuttings are given.

762. Reid, F. R., Cowgill, W. H., and Close, A. W. 631.811.91
Plunging of potted plants in relation to moisture and nutrient supply.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 323-30, bibl. 1.
Trials at Glenn Dale, Md, show the advantages to be gained as regards nutrition and growth by plunging potted plants into a medium of peat or sand rather than the bare staging of a greenhouse.

763. Felber, I. M. 547.458.81
Persistence of the moisture conserving effect of methyl cellulose in soil.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 331-7, bibl. 1.
Pot experiments at East Lansing confirm the favourable verdict on the water-conserving influence of methyl cellulose in potted soil. Methyl cellulose fibre can be successfully substituted for its dispersions and offers a simpler method of application. Its properties are discussed and are considered to make it suitable for such purposes as:—tree wound dressing, protection of seeds and fruits against insects, the prevention of root drying when transplanting, as a culture medium for bacteria and for sterile tissue culture.

764. Jones, L. K. 635.936.69: 632.8
Mosaic, streak and yellows of carnation.
Phytopathology, 1945, **35**: 37-46, bibl. 5, being *Sci. Pap. Wash. St. Coll. Agric.* **612.**
The very injurious carnation virus disease known as yellows is caused by the transmission of the streak virus to a mosaic-infected plant. Since mosaic is commonly present in carnation, the control of the aphid vector of streak is the most important measure for the control of yellows. It is furthermore essential to provide optimum conditions for the plants, as all growth-checking factors favour the development of the virus. The roguing of infected plants before taking cuttings is not practicable, the symptoms not being sufficiently conspicuous during the winter months. Neither of the viruses is transmitted in the seed, but great care is required to avoid mechanical transmission of mosaic, if new varieties are grown in the vicinity of commercial varieties. The symptoms of the three virus diseases are described and some data on their incubation period and their temperature range are presented.

765. Čuvaev, P. P. 635.937.34: 631.535
Importance of date in setting cuttings of *Rosa gallica*. [Russian.]
Sovetsk. Botan., 1944, No. 2, pp. 38-40.
Cuttings of *Rosa gallica* L. were taken on November 30, and subsequently every ten days until February 15 inclusive. The autumn cuttings produced only vegetative shoots. Those planted on January 5 were the first to form flower buds, and the proportion of such buds increased with each successive date. The middle buds of a stem from which cuttings were taken were the most vigorous, and readiest to pass into the reproductive stage. It was evident that a cold temperature, exerting its influence on the buds, was necessary after the buds had passed the dormancy stage, to enable reproductive, and not vegetative, shoots to develop. It is believed, though not yet finally proved, that the temperature required lies between 0° and +15° C.

766. Lyle, E. W. 635.937.34: 632.4
Control of black spot of roses with sulphur-copper dust.
Bull. Tex. agric. Exp. Stat. **648**, 1944, pp. 27, bibl. 17.
Successful control of black spot of roses caused by the fungus *Diplocarpon rosae* was obtained at Substation No. 2, Tyler, Texas, by applications of 15-25 lb. per acre of a sulphur-copper dust containing about 90% of an unconditioned 325-mesh sulphur and about 10% of an insoluble copper compound. Dusting should be started at the first appearance of the disease and be repeated at weekly intervals until July or until hot, dry weather sets in. The applications should then be continued at about fortnightly intervals, preferably within 24 hours after each rain, but not more often than once a week.

767. Jones, L. K. 632.8: 635.939.98
Streak and mosaic of cineraria.
Phytopathology, 1944, **34**: 941-53, bibl. 8, being *Sci. Pap. St. Coll. Wash.* **596.**
The symptoms of the streak and mosaic virus diseases of cineraria are described, of which the first often causes losses amounting to 20-50% in Washington greenhouses. Both viruses are transmitted in seed, the vectors being *Thrips tabaci* and *Aphis marutae*, respectively. The streak virus is a strain of the tomato spotted-wilt virus, while the mosaic virus appears to be specific to cineraria. Control consists mainly in the selection of disease-free seed. Other

useful measures are aphid and thrips control, destruction of possible weed hosts in the vicinity and care in handling mosaic plants.

768. Middleton, J. T., Tucker, C. M., and Tompkins, C. M. 635.965.23: 632.411
A disease of gloxinia caused by *Phytophthora cryptogea*.
J. agric. Res., 1944, **68**: 405-13, bibl. 17, being *J. Ser. Pap. Mo. agric. Exp. Stat.* **888.**
A corm, stem and leaf disease of gloxinia is occurring on an economic scale in different parts of California. It is caused by *Phytophthora cryptogea*, as proved by a joint study of the California and Missouri Agricultural Experiment Stations. The symptoms consisting of lesions and necrotic areas are described. Infected leaves are water-soaked, dark brown and flaccid. Fifteen hosts of the fungus among other *Gesneriaceae* species are recorded for the first time.

769. Dimock, A. W., and Baker, K. F. 635.935.471: 632.411
Hot-water treatment for control of *Phytophthora* root rot of calla.
Phytopathology, 1944, **34**: 979-81, bibl. 5.
The soaking of white calla rhizomes in hot water at 122° F. for one hour proved as effective for the control of the root rot fungus, *Phytophthora richardiae*, as chemical treatment, but was found to cause less delay in sprouting or blooming.

770. McClellan, W. D., and Stuart, N. W. 635.935.722: 632.48
The use of fungicides and growth substances in the control of *Fusarium* scale rot of lilies.
Phytopathology, 1944, **34**: 966-75, bibl. 15.
Arasan* and Spergon† were found, at Beltsville, to protect the very susceptible bulb scales of *Lilium longiflorum* and *L. testaceum* and the scales of the less susceptible Easter lily against rot caused by *Fusarium oxysporum* f. *lilii* and, in addition, to stimulate the production of roots, bulblets and shoots. The stimulating effect was increased by adding 1 part of indolebutyric or naphthaleneacetic acid to 5,000 parts of the fungicide. The combinations proved superior in their stimulating effect to the use of growth-substances alone, the best combination being Arasan + naphthaleneacetic acid. The results obtained with 4 other fungicides are also discussed and the effects produced by all the chemicals tested are photographically illustrated.

771. Dosdall, L. 635.944: 632.482
Rhizome treatments for controlling Botrytis crown rot in iris.
Phytopathology, 1944, **34**: 772-89, bibl. 8, being *Pap. sci. J. Ser. Minn. agric. Exp. Stat.* **2142.**
Under the climatic conditions prevailing in Minnesota crown rot of iris, caused by *Botrytis convoluta*, is primarily a disease of the dormant plant. It is often overlooked, and failure of the plants to develop in spring is attributed to winter injury. Calomel, Semesan, yellow oxide, mercuric chloride and acid mercury treatments of the rhizomes at transplanting time gave effective control, provided the rhizomes were planted in clean soil. The concentrations used are stated. The trials extended over a period of 4 years, during which more than 5,000 rhizomes of 14 varieties were treated.

772. Stofmeel, W. S. 635.944: 632.482
De *Botrytis*-aantasting van Gladiolus-knollen en haar bestrijding. (***Botrytis* infection of gladiolus bulbs and its control.**)
Tijdschr. PlZiekt., 1941, **47**: 154-63, from abstract *Zbl. Bakt.* IIte Abt., 1943, **106**: 78.
Botrytis on gladiolus is best controlled by rapid drying of the bulbs after harvesting in well ventilated, hot air. The disease was found to be more severe with bulbs lifted late in the season than with those harvested at the ordinary time.

773. Wilson, J. W., and Watson, J. R. 635.944: 632.73
The gladiolus thrips in Florida. With notes on other thrips found on gladiolus.
Bull. Fla agric. Exp. Stat. **357**, 1941, pp. 24, bibl. 28.
The life history and biology of *Taeniothrips simplex* in Florida and its biology are described and the following control measures are suggested: (1) Remove the corms from the field and clean them immediately after digging or (2) store the corms at 38-40° F. for 3-4 months. (3) If necessary, fumigate the corms with ethylene dichloride-carbon tetrachloride or calcium cyanide at the rate of 14 lb. and 3 oz. per 1,000 cubic feet respectively for 18 and 3 hours or (4) dip in a mercuric chloride solution, 1 oz. to 7½ gal. of water for 18 hours. (5) When the first signs of injury appear on plants growing in the field give 5-7 applications at weekly intervals of a tartar emetic bait spray (4 lb. tartar emetic, 16 lb. brown sugar to 100 gal. of water), which becomes more effective if allowed to collect in droplets. The naturally occurring predators of the pest are of no commercial importance. A few other thrips species found on gladiolus are described.

774. Baines, R. C. 632.48: 635.976.3
(8) **Verticillium wilt and die-back of *Viburnum*.**
Phytopathology, 1945, **35**: 145-7, bibl. 4, being *J. Pap. Purdue Univ. agric. Exp. Stat.* **174.**
Brierley, P., and Smith, F. F. 635.944: 632.8
Additional species of *Lilium* susceptible to lily-rosette virus.
Phytopathology, 1945, **35**: 129-31, bibl. 5.
Laurie, A., and Ray, S. 635.939.98: 631.535
Studies on various methods of handling chrysanthemum cuttings.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 455-60.
Shippy, W. B. 635.937.34: 632.42
Powdery mildew of roses.
Pr. Bull. Fla agric. Exp. Stat. **564**, 1941, pp. 2.
Vasconcellos, P. W. C. 635.944
Cultura do lírio do Japão. (**Cultivation of *Lilium longiflorum* Thunb.** [**in Brazil**].)
Rev. Agric. S. Paulo, 1944, **19**: 173-80.
Watkins, J. V. 635.939.98(759)
Garden chrysanthemums for Florida.
Pr. Bull. Fla agric. Exp. Stat. **559**, 1941, pp. 3.
Wilmot, R. J. 635.938.23
Camellia culture.
Pr. Bull. Fla agric. Exp. Stat. **604**, 1944, pp. 3.
Wilmot, R. J. 635.939.124
Azalea culture for Florida.
Pr. Bull. Fla agric. Exp. Stat. **603**, 1944, pp. 3.

CITRUS‡ AND SUB-TROPICALS.

775. California Citrograph (Symposium). 634.1/7(794)
What varieties should I plant?
Calif. Citrogr., 1945, **30**: 68-9, 80-85.
Suggestions of suitable varieties of various fruits for planting in Southern California are made, each fruit being dealt with by an authoritative expert. The fruits discussed are peaches (see abstr. 458), figs, apples and pears, cherimoya and sapote, persimmons and loquats, avocadoes, apricots, plums and berries, guavas and feijoas. The series concludes with notes on the correct method of planting trees.

* 50% tetramethyl thiuramdisulphide.
† 98% tetrachloro-para-benzoquinone plus 1% of a buffering agent.
‡ See also 586.

776. LYNCH, S. J. 634.337
Some analytical studies of the Persian lime.
Bull. Fla agric. Exp. Stat. **368,** 1942, pp. 24, bibl. 9.

No correlation was found between specific gravity of the whole [Persian] lime fruit and its per cent. juice content by weight. Fruit analysed from trees of different ages (4 years, 7 years, and 11 years), all on rough lemon rootstock, showed wide variation in weight and size for fruit of the same age throughout the growth period. The fruit reached maturity, as measured by palatability and satisfactory juice and acid content, in from 125 to 140 days from blossoming. The analysis of fruit from trees grafted on different rootstocks (rough lemon, grapefruit, Cleopatra, bittersweet, sour orange and willowleaf sour orange) during the growth period of the fruit indicated: that fruits grown on rough lemon rootstock were of greatest weight and size throughout the growth period sampled, while fruits grown on the other rootstocks were generally of similar weight and size at any particular age sampled; that there is a general difference in fruit weight and size in different years; that the juice content of the fruit increased with maturity and was similar for the fruit from the different rootstocks at each sampling period; that after the 154-156-day age period, the juice content became either stationary or decreased slightly; that the per cent. acid content of the juice was not influenced either by the rootstock or by the age of the fruit as represented in the samples; that soluble solids content of the juice was not influenced by the rootstocks tested. [From author's summary.]

777. BENTON, R. J. 634.3-1.541.11: 634.321
***Poncirus trifoliata* as a stock for commercial citrus varieties. Value of its immunity to *Phytophthora* root rot.**
Agric. Gaz. N.S.W., 1944, **55**: 342-4, 384-6, 391.

From a survey of the performance of *Poncirus trifoliata* rootstocks in New South Wales based on observations of approximately 950 trees of mixed orange and mandarine varieties not less than 33 years old and of over 9,000 trees from 3 to 10 years of age, the conclusion is drawn that this rootstock has certain desirable characteristics, apart from its immunity to *Phytophthora* root rot, viz.: (1) The ability to thrive in soils too moist for other rootstocks; (2) a beneficial influence on flavour and fruit quality in general; (3) the induction of early bearing—often as early as the second year and (4) a tendency to increase production, especially under conditions of drought. With some varieties, such as Navels, Marsh and others, a certain incompatibility is shown, becoming manifest as bark-scaling below the bud union, associated with dwarfing. Slight to severe dwarfing has been observed in some varieties on *P. trifoliata* also, independent of bark-scaling. The state and performance of the over 30 year old trees, however, suggests that *P. trifoliata* is to be regarded as a valuable rootstock under a variety of conditions in New South Wales. The history of the introduction of the rootstock is traced and the locations and soils of trees on *P. trifoliata* are described.

778. BLISS, D. E. 634.3: 581.036: 631.436
Air and soil temperatures in a California citrus orchard.
Soil Sci., 1944, **58**: 259-74, bibl. 9, being *Pap. Univ. Calif. Citrus Exp. Stat.* **514.**

Air and soil temperatures were recorded from February 1939 to July 1943 in a Valencia orange orchard near Anaheim, in the most important citrus growing region of California, where the climate is one of the most favourable for Valencia oranges in the State. The data are summarized as weekly mean temperatures and as yearly ranges. While the temperature curve for soil at the 8-foot depth lagged for several weeks when compared with the air temperature curve, that for the soil at the 1-foot depth showed only a brief lag. The yearly maximum temperatures of air and soil were more or less concurrent. The data presented provide the material for many more comparisons and the relation between the range of daily temperature fluctuations and different meteorological conditions is discussed.

779. GUEST, P. L., AND CHAPMAN, H. D. 634.3-1.4-1.415
Some effects of pH on the growth of citrus in sand and solution cultures.
Soil Sci., 1944, **58**: 455-65, bibl. 6, being *Pap. Univ. Calif. Citrus Exp. Stat.* **516.**

It was the object of this investigation to throw some light on the direct effect of the pH value upon sweet orange seedlings as opposed to the widely studied indirect effect resulting from the acidity or alkalinity of the medium. Although it was difficult to exclude the indirect influences, it could be shown that hydrogen and hydroxyl ion concentrations corresponding to pH values between 4·0 and somewhat above 9·0 did not have any harmful effect on the seedlings. The extreme values tested in this experiment, which caused the death of the plants within a few days, lay at pH 2·0 and 11·0. It was not possible to determine the exact limits beyond which hydrogen and hydroxyl concentrations become injurious.

780. OBERHOLZER, P. C. J. 634.3-1.415
The influence of soil pH on citrus.
Fmg S. Afr., 1944, **19**: 695-8.

A preliminary survey of citrus soils in South Africa showed that the desirable neutral to alkaline reaction is found in the Eastern Cape Province and in the Muden district in Natal, both successful citrus areas, while the Transvaal Lowveld as well as the South-western Cape Province have the most acid soils on which citrus is grown, with a pH value of 5·5 and sometimes of 5. Since these acid soils are at the same time deficient in exchangeable bases and have a low buffer capacity, it is essential to discontinue further acidification by substituting calcium or sodium nitrate for ammonia-containing fertilizers. This recommendation applies to the following regions: The Lowveld, Rustenburg, Citrusdal and possibly Letaba and Zebediela.

781. SINCLAIR, W. B., AND RAMSEY, R. C. 634.31: 581.192
Changes in the organic-acid content of Valencia oranges during development.
Bot. Gaz., 1944, **106**: 140-8, bibl. 9, being *Pap. Univ. Calif. Citrus Exp. Stat.* **519.**

The maximum amount of free acid in Valencia orange fruits was found to develop early in the season and to change very little thereafter. The concentration of free acids in the juice, however, lessens considerably during fruit development. This decrease in free acidity, with the corresponding increase in pH, was due chiefly to the decrease in concentration of free citric acid. Although the malic-acid concentration in the juice stayed nearly uniform during the season, the actual amount in the fruit increased. The concentration of combined acids remained nearly uniform in the fruit, but the absolute amount of combined acids determined from the alkalinity of the ash were in agreement with the values determined from the difference between the total- and free-acid radicals. During ripening, the changes in pH of the juice were definitely related to changes in percentages of the total-acid radical in the free form. A similar relation was noted between pH and the percentage of free acid expressed on a fresh-weight basis.

782. HARDING, P. L. 634.323: 581.192: 577.16
Seasonal changes in the ascorbic acid concentration of Florida grapefruit.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 72-6, bibl. 8.

Trials were made over four seasons in Florida with Marsh and Duncan grapefruit on the ascorbic acid concentrations

n the fruit. Although the percentage decreased as the fruit ipened, the total ascorbic acid per fruit was greatest in ripe ruit owing to the great increase in juiciness. There was ittle difference between varieties, and rootstocks appeared o have little effect, though slightly lower average ascorbic cid concentration in Marsh was found on rough lemon han on sour orange. Spraying in summer with one pplication of lead arsenate at 1 lb. to 100 gallons water ad no marked effect.

783. Jones, W. W., Bitters, W. P., and Finch, A. H. 634.3-1.84
The relation of nitrogen absorption to nitrogen content of fruit and leaves in citrus.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 1-4, bibl. 3.
Studies on Marsh grapefruit and Valencia oranges from two districts in Arizona showed that no increase in nitrogen in mature fruit on the tree resulted from winter application of a nitrogenous fertilizer, from which it is concluded that this standard practice does not contribute to the deterioration of the fruit hanging on the tree in the winter and spring.

784. Rutherford, D. M. 634.323
Care and feeding of grapefruit trees,—Arizona style.
Calif. Citrogr., 1945, **30**: 67.
On deep sandy desert soils of the Yuma Mesa in California, with hot summers and mild winters, success of the grapefruit crop depends on the application of nitrogen at the correct ime and on adequate moisture. By the systematic applica- ion of nitrogen in winter or late in the autumn, when the naturing fruit will not be affected, and by the growth of over crops in summer the question of off grade fruit has been largely eliminated. Farm manure applied in winter did not decompose till spring, with the result that the trees went to leaf instead of fruit. Now nitrogen is applied in any form in which the trees can assimilate it quickly.

785. Finch, A. H. 634.323-1.8
Fertilizing desert grape fruit.
Calif. Citrogr., 1944, **30**: 34-5.
The article is based on the work of the Horticultural Depart- ment of Arizona University over the past 8 years. The seasonal nitrogen content of the tree determines the yield of fruit and those various physical and chemical characteristics of the fruit that affect its market value. Arizona soils are well supplied with phosphorus, calcium and potassium and the minor elements, and all that is required is to adjust the nitrogen level for best yield and quality. The problem is not merely one of applying nitrogen but of controlling the seasonal supply. The effects of high and low nitrogen levels at various seasons are explained. The condition which gives the best fruiting is a high level of leaf nitrogen content in winter and spring, declining to a low level in summer and autumn. Trees treated to produce these conditions will be green during winter and spring and quite yellow by autumn. Yields are high and steady from year to year, the fruit has thinner rind, colours earlier and can be held on the tree longer in spring. Brix/acid ratio is higher and vitamin C materially increased. Fruit may be small in the early part of the shipping season. It is recommended that regular monthly leaf analyses should be made in winter and nitrogen applied or not in accordance with the result, e.g. on 1 December 1·33% nitrogen content is low and suggests the application of ¼ to ½ lb. per tree. A content of 1·80% is high enough and requires no addition, especially if the trees were given nitrogen the previous year. Excess nitrogen, especially on heavier desert soils where it does not leach out, can seriously disturb the fruiting balance of the tree. Fruit will take up nitrogen readily when in growth but once the fruit has coloured no nitrogen taken up by the tree will move into the fruit. Thus excess winter nitrogen applications will not harm the crop on the tree, it is the nitrogen that goes into the fruit during the previous summer that causes it to get soft and puffy in the following spring. The Arizona Citrus Growers Association have made what is considered to be the first attempt to provide on a co-operatively scientific basis for orchard management by setting up and equipping a laboratory with facilities for periodic nitrogen content determination of leaves of all members' orchards. Their recommendations for manuring and other cultural practices will be based on the nitrogen content of the leaves submitted.

786. Aldrich, D. G., Chapman, H. D., and Parker, E. R. 634.3-1.84
Ammonium sulfate and sodium nitrate as fertilizers for citrus.
Calif. Citrogr., 1944, **30**: 38, 46-7, bibl. 6.
In this paper from the Riverside Citrus Experiment Station the underlying causes of the influence of sodium nitrate and ammonium sulphate on water penetration in soils and the interaction of other factors such as soil type, irrigation water, cultivation and fertilizer practice are discussed. Water penetration and aeration may be hindered by chemical changes leading to structural alteration of the soil, if sodium nitrate or ammonium sulphate are applied in large concentrated doses over a period of years. The condition is aggravated by frequent cultivation and high sodium content in the irrigation water. Under conditions involving the use of bulky organic matter and the growth of good cover crops these fertilizers can be used without ill effects under all conditions.

787. Cameron, S. H., and Hodgson, R. W. 634.31-1.542
Effect of season of pruning and number of new shoots on the rate of top regeneration of Valencia orange trees.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 18-26, bibl. 7.
From this study of the effect of pruning on Valencia orange trees at Los Angeles, Calif., the authors deduce the following conclusions: 1. Trees with an unrestricted number of new shoots regenerate new tops more rapidly than do those with a smaller number of new shoots. The differences are more pronounced in spring-pruned than in autumn-pruned trees. 2. The rate and amount of regeneration seem to be influenced in the initial stages by the supply of materials available for growth at the time of pruning and by some unknown factor associated with cyclic growth. Later the size of the leaf surface developed appears to assume the dominant role. [Authors' summary.]

788. Smith, R. J. 634.334-1.556.1
How fast are lemons picked ?
Calif. Citrogr., 1945, **30**: 66-7.
An analysis of the picking rates of a large number of lemon groves in Ventura County shows that speed is affected by tree type, differences in yield and fruit sizes. It is shown how this information on rates of picking can be of real use in setting up wages rates for picking. If a single box rate large enough to provide an incentive is applied to all picking, it must result in extreme variation of earnings. If the same rate is applied to all picking conditions the good orchards will pay a substantial subsidy to the poor orchards. Standard practice is to alternate crews between good and bad orchards, so that the poor orchard is picked at a given rate because of the prospect of better picking of the good orchard at the same rate.

789. Oppenheimer, H. R. 634.3-1.538
The treatment of neglected citrus groves.
[Hebrew.]*
Hassadeh, 1943, Vol. **23**, No. 5, pp. 129-32.
The object of this paper is to advise local owners of citrus plantations, neglected through loss of market due to the

* Abstract made from English translation by C. Oppenheimer, of Rehovoth Agricultural Research Station.

war, of the best way to bring them back into productive bearing. With trees on good soils all that is wanted is to clear the intruder grasses, prune away the dead wood, which, if irrigation has been withheld during the past few years, will be plentiful, and supply a reasonable quantity of manure. In adverse soil conditions where trees are suffering from malnutrition and other ills, or if parts of the bark are yellow (sunburn), or peeling, or the leaves fall freely and those that remain turn yellow, or if the trees are gumming, or when cut back produce but few shoots, then it may be better to discard the tree, though a nitrogen fertilizer might be tried first. Trees which it is hoped to save should be pruned back into uninjured wood, but not, if possible, to where the branches exceed 5 cm. in diameter or the sudden discontinuation of sap flow may bring about sunburn. In Palestine February is the best month for severe cutting back, trees cut back in summer will probably be severely injured, especially if already in poor condition. Trees should be whitewashed as a precaution when cut back, even though in winter they may recover without it. No amount of whitewashing will save a tree that is cut back during the hot season. The larger wounds should be dressed after severe pruning; whether the dressing is of mud alone, mud mixed with manure or the usual dressing of asphalt and wax seems immaterial. Trees cut back may develop mottle leaf for a time, but are not likely to be infected by little leaf disease, as is sometimes asserted. Shamouti (Jaffa) oranges on sour orange stock are less affected by neglect than those on sweet lime. Instructions are given for shaping and staking, where necessary, the severely pruned tree. Reshaping the top of regenerating trees is not indispensable if the tree is strong and healthy, since the tree may recover very well without it. Severe deheading delays cropping to such an extent as to be uneconomical, but fruit should not be allowed to ripen during the first two years or the tree may be checked. It is emphasized that cutting back alone will not rejuvenate a neglected orchard, but that the eradication of perennial weeds, adequate manuring and irrigation are essential parts of successful treatment.

790. Coit, J. E. 634.31-2.19
Why navel oranges split.
Calif. Citrogr., 1944, **30**: 18.
The abnormal structure of the navel orange causes splitting of the fruit in cases where the sap stream flows too strongly, especially with fruit on the outside of the tree. Splitting may be largely prevented by removing rampant tree suckers, by increasing the proportion of inside fruit by leaving small fruiting twigs along the main branches and encouraging their fruit set by opening holes in the top canopy to admit light, and by girdling, a practice which increases the proportion of inside high quality fruit without damage to the tree. A different type of split, known as the side split, is due to a malformation in which a segment is covered by a strip of skin weaker than the rest, and a split is liable to occur here under irrigation or in wet weather. No remedy is known.

791. Forbes, A. P. S. 634.3-2.191: 546.47
A common citrus disease in Nyasaland.
Nyasaland agric. quart. J., 1944, **4**: 4: 6-8.
Chlorosis or mottle due to zinc deficiency is a common trouble of citrus in Nyasaland. The following spray formula, the application of which is described in detail, has been reported to cure the symptoms: 10 lb. zinc sulphate (89% pure) and 5 lb. finely ground hydrated lime per 100 gal. water.

792. Fawcett, H. S. 634.3-2.8
Psorosis and related virus disorders on citrus.
Calif. Citrogr., 1944, **30**: 14-5.
A group of disorders of citrus previously thought to be due to different diseases have one common symptom, small, light-coloured flecks or clear areas in the region of the small veinlets of young leaves. The diseases named are: (1) psorosis A, producing leaf and bark symptoms on orange, grapefruit and tangerines or leaf symptoms only on lemons, and their decline, slow or rapid, according to degree of virulence; (2) psorosis B, extremely virulent but uncommon, causing young leaf symptoms, severe bark scaling and rapid decline, also ring spot markings on fruits, twigs and mature leaves; (3) concave gum disease, known from gumming concavities in the bark, fairly common in orange trees; (4) blind pocket with trough-like depressions in the bark, often with convex sides and with a gummy, cheesy region under the bottom of the depression; and (5) crinkly leaf, named from pocketing, crinkling and warping of the leaves, and infectious variegation, these two chiefly found on lemons. All five forms are transmissible by budding and all produce a common leaf fleck. The only method of prevention is to plant trees from buds of virus-free parents. Over 700 such trees have been registered by the State Nursery Service and they should form the sole source of supply. Trees affected by psorosis may have their commercial life prolonged for 5 to 15 years by scraping off the outer layer of bark of the lesion and of the sound bark immediately surrounding it, painting the wound with a mild solution of permanganate of potash (1 oz. to 1 pint water) in wet weather. No treatment is required in dry weather. So far as is known these diseases can only be carried in nature by a grafting of the roots of adjacent trees which meet underground.

793. Brooks, C. 634.31-2.4
Stem-end rot of oranges and factors affecting its control.
J. agric. Res., 1944, **68**: 363-81, bibl. 16.
In a study of the *Phomopsis* and *Diplodia* stem-end rots of Californian and Florida oranges, carried out at Beltsville, Md, in the initial stages and at Orlando, Fla, in the later stages, it was found that the fungi readily gain entrance to the fruit through the button. Fruits treated with ethylene for 42-45 hours at a temperature of 80-85° F. showed about 9 times as much stem-end rot as the controls at the end of two weeks after harvest. The increase in infection was probably due to the effect of the gas on the buttons. An application of 1·2% orthophenylphenate included in the water phase of a water wax emulsion at 90-100° F. gave the best control of all treatments tested, but both the phenate and 5% borax applied as solutions also proved effective. A 1·2% solution of the phenate did not cause any injury at temperatures up to 100° F. when followed by thorough washing.

794. McGregor, E. A. 634.3-2.72
The citrus thrips, measures for its control, and their effect on other citrus pests.
Circ. U.S. Dep. Agric. **708**, 1944, pp. 12, bibl. 17.
The life history of the citrus thrips, *Scirtothrips citri*, and its economic significance on the Pacific coast of California are described. The following control measures are recommended:—Oranges: One spraying with tartar emetic (1½ lb. tartar emetic, 1½ lb. sugar in 20-50 gal. water per acre) or with lime-sulphur at the time when the fruits are growing from pea size to walnut size. Lemons: Three applications of the tartar emetic spray during the period 1 June to 15 October in localities where the thrips have not developed tolerance to the chemical, or 5 dustings with sulphur where they have developed it. Sulphur dustings were observed to reduce at the same time infestations of the citricola scale, *Coccus pseudomagnoliarum*, and of the black scale, *Saissetia oleae*, as well as of the citrus red mite, *Paratetranychus citri*, provided the temperature was sufficiently high to activate the sulphur. Lime-sulphur spray and sulphur dust gave also good protection against splitting and *Alternaria* diseases of oranges.

795. Bartholomew, E. T., Sinclair, W. B., and Lindgren, D. L. 634.31-2.944
Absorption of hydrocyanic acid by Valencia-orange fruits and leaves fumigated at atmospheric pressure and at partial vacuum.
Plant Physiol., 1945, **20**: 62-78, bibl. 11, being *Pap. Calif. Citrus Exp. Stat.* **517.**

As determined by recovery values, the amounts of HCN absorbed by Valencia orange fruits increased almost linearly for each 10-minute exposure period from 10 to 60 minutes; after that, the curve began to flatten. With dosages of 6, 8, 10 and 12 ml. HCN per 100 cu. ft., fruits fumigated in a fumatorium at atmospheric pressure absorbed a little less than half as much HCN as fruits fumigated at a partial vacuum of 26 inches. In experiments where the concentrations of HCN were constant but where the lengths of exposure periods varied, no fruits were visibly injured at any of the 10-minute intervals below 50 minutes, but at the longer periods of exposure (50, 60, 70 and 80 minutes) the numbers of fruits injured became increasingly greater. The results of the experiments with Valencia orange leaves showed that the amounts of HCN absorbed by leaves fumigated at atmospheric pressure were always less than the amounts absorbed by leaves fumigated at the same time of day but at partial vacuum. The possible function of the stomata in governing the absorption of HCN by citrus fruits and leaves is discussed. [From authors' summary.]

796. Bartholemew, E. T., and Sinclair, W. B. 634.3-2.19: 632.951
Granulation and juice quality in Valencias as affected by insecticides.
Calif. Citrogr., 1944, **30**: 4-5, bibl. 1.

As a result of tests on two commercial groves made by the Riverside Citrus Experiment Station, California, from 1939 to 1944, added evidence is produced that oil sprays cause an increase in amount and severity of granulation and a reduction in soluble constituents in Valencia oranges.

797. McGregor, E. A. 634.3-2.654.2-2.96
A new potential enemy of the bud mite.
Calif. Citrogr., 1944, **30**: 53.

A note and illustration is given of the predaceous mite *Cheletogenes ornatus*, which has been observed feeding on the common tarsonemid mite of citrus *Tarsonemus bakeri* and on the bud mite on lemons in S. California. Many dead bud mites were observed.

798. Baker, A. C., and others. 634.1/7-2.77
A review of studies on the Mexican fruitfly and related Mexican species.
Misc. Publ. U.S. Dep. Agric. **531**, 1944, pp. 155, bibl. 92.

The publication summarizes the results of studies conducted in Mexico by the laboratory of the Bureau of Entomology and Plant Quarantine of the U.S. Department of Agriculture, Mexico City. A thorough study was made both of the life history and biology of *Anastrepha ludens* and some related species and of control measures against the pest in the larval and adult stage. The damage caused is described and a list of hosts is given. *A. ludens* larvae in mango were successfully controlled by sterilization at 110° F. according to the vapour-heat process (an 8-hour approach followed by a 6-hour exposure at 110° F., with saturated vapour throughout the full 14 hours). With citrus the sterilization method did not seem practicable, as *A. striata* larvae are less susceptible to heat than those of *A. ludens*. Cold treatment, however, gave good results in all cases; the temperature and times of exposure recommended are: 30-31° F. for 15 days; 32-33° F. for 18+ days; 33-34° F. for 20 days and 34-35° F. for 22+ days. If larvae-infected fruits are buried, they should be covered with 18 inches of carefully packed soil. Of nearly 500 materials tested in traps to attract adult flies broth cultures of bacteria from uninjured mango fruit showed the greatest promise. Experiments suggest that wild yeasts may also have a strong attraction. The highest reduction of fly population by spraying was achieved with a soluble tartar emetic spray at the rate of 4 lb. tartar emetic in 100 gal. of solution containing 5% molasses. A kill of 91% was observed in grapefruit trees, but rain was found to affect the results. Other sprays showing some success were a nicotine sulphate-molasses solution used at the rate of 1 part of nicotine sulphate (40% nicotine) in 200-300 parts of aqueous solution containing molasses, which was effective only in dry weather, and a mixture containing 4 lb. lead arsenate and 4% blackstrap molasses in 100 gal. of aqueous solution.

799. Hayward, K. J. 634.1/8-2.77
Las moscas de las frutas en Tucumán.* **(Fruit flies in Tucuman.)**
Circ. Estac. exp. Agric. Tucuman **126**, 1944, pp. 10.

A study of the biology and methods of control of the fruit flies (especially *Anastrepha fraterculus*) in Argentina, where they have been given legal status as a National Pest, attacking, as they do, almost every kind of fruit. The methods of control discussed are the usual ones of trapping, spraying, destruction of fruit that has been attacked and biological control. In trapping it has been found that a bait may not be equally effective everywhere and that, not only have different species of the fly different preferences, but that the preference of any one species may vary with the locality. Good all round baits easily made are: (a) a mixture of 1 part vinegar with 3 of water; (b) a mixture of stout and water in equal parts; (c) 1 part molasses to 12 of water; (d) the juice of whole citrus fruits including the rind; damaged fruit can be used. Baits (c) and (d) should be prepared a week in advance to admit of fermentation. Arsenic baits more difficult to prepare are mentioned. A formula for a spray is molasses 5 litres, sodium fluosilicate 150 g., water 100 l. This should be applied weekly during the fly season. Care must be taken to avoid spraying fruiting branches or the fruit may become discoloured. In large orchards, where a number of trees may not be fruiting, the non-bearing trees may be sprayed with an attractive poison bait. Fruiting trees must not be treated with poison.

800. Persing, C. O. 634.3-2.64
Snail baits.
Calif. Citrogr., 1945, **30**: 94-5.

There are 4 principal snail baits in use in the citrus orchards of California. 1. Calcium arsenate 6% on red flaked bran, applied by power blower or by hand on the tree at ½ lb. per tree. 2. Calcium arsenate 4% on fresh orange pulp mixed in a cement mixer, applied by hand on the tree at 1 lb. per tree. 3. Commercial metaldehyde bait containing 2·75% metaldehyde, applied in small piles on the ground at ⅓ lb. per tree. 4. Tartar emetic 2 lb., sugar 4 lb., water 100 gal., applied with broom guns using 500 lb. pressure at 3 to 4 gal. per tree. One application of an effective snail bait applied when snails are active should provide sufficient check for 1 year. Bran or orange baits stick best if applied when the tree is damp, tartar emetic after it is dry. Meta baits are most effective when there are high temperatures and much sunlight. Application to the tree should be made a week after the cover crop has been worked under; this will give time for the snails to reach the trees. Calcium arsenate bran is best applied by power blower; orange pulp is thrown into the trees by hand from a truck driving down each middle row. Baits 1, 2 and 3 are equally effective and more so than meta, from which many snails recover, especially if shaded. In hot, dry weather tartar emetic gives the best control because it is applied wet and the snails then drink it. Meta appears more effective because it concentrates the dead snails round the bait piles where they are easily noticed. Arsenate-orange pulp, tartar emetic and meta are all safe, whereas arsenate bran baits have been known to cause serious damage to trees. Calcium arsenate orange pulp

* See also *Bol.* 31, 1940; *H.A.*, 14: 1153.

applications cost 3 cents per tree, the other treatments are more expensive. Cheap wheat flour 8 lb. per 100 gal. water makes a substitute for sugar in the tartar emetic spray but sugar is preferable.

801. (Entomological Club of Southern California.) 632.951

Summary of discussion on D.D.T.

Calif. Citrogr., 1944, **30**: 54-5.

The discussion summarized was participated in by officers of Riverside Citrus Research Station and of the U.S. Department of Agriculture. The results discussed are those of only one year on citrus. *Red scale*: Kill with D.D.T. was not significant with mature insects. Field trial results of D.D.T. applied at strengths up to 5% in kerosene stock solution were not so good as those from an ordinary oil spray. Moreover under summer conditions it decomposed rapidly in the field. *Purple scale, citrus red spider, citrus bud mite*: Results were not encouraging. *Citrus thrips*: Offers promise as a control for citrus thrips and citricola scale; the D.D.T. sprays gave better control than dusts and were equal in effect to the results of the current nicotine spray programme. *Snails*: In laboratory tests D.D.T. was only slightly toxic to the common brown snail. *Beneficial insects*: Proved very toxic to parasites and to the ladybird beetles. *Effect on citrus fruits*: Penetrates into the outer peel if not removed by washing. *Toxicity*: Declared a poison by the U.S. Division of Pharmacology and only to be used after investigation has shown it to be safe for a particular purpose.

802. Cox, A. J. 632.951

Drug aspects of DDT.

Calif. Citrogr., 1944, **30**: 6, 22-3, 26.

An examination of the pharmacology of D.D.T. shows that it may manifest decidedly unfavourable effects both on man and animal, frequently in an unpredictable manner. Little, however, has been published because of the difficulty of obtaining the drug and all information seems to originate in 3 articles published in the 28 July and 4 August, 1944, numbers of U.S.A. Public Health reports, entitled Experimental poisoning with D.D.T., The pharmacologic action of D.D.T., and Histopathological changes following D.D.T. administration.

803. Isbell, C. L. 633.492

A continuous supply of fresh sweetpotatoes for table use on the farm.

Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 391-5.

Practical hints based on trials in Alabama are given on the harvesting, storing in clamp and removal for use of sweet potatoes.

804. Webster, C. C., and Selby, M. F. H. 633.85-1.541.5

A progress report on the selection and vegetative propagation of promising tung trees (*Aleurites montana*).

Nyasaland agric. quart. J., 1944, **4**: 4: 6.

The results so far obtained at the Tung Experimental Station, Nyasaland, suggest that budded tung trees will give better results than seedlings. One of the main objects of the Station's work since its foundation a few years back has been to select a certain number of outstandingly high yielders for vegetative propagation from 27,000 trees surveyed. Final selections are based on the performance of the buddings and not on that of the mother tree.

805. Sell, H. M., Taylor, H. A., and Potter, G. F. 633.85: 577.15.04

Effect of chemical treatments in prolonging dormancy of tung buds. II.

Bot. Gaz., 1944, **106**: 215-23, bibl. 14.

The attempt was made to reduce the losses from spring frosts in tung-oil in the United States by prolonging the dormancy of the buds. (See also *ibidem*, 1942, 103: 788-93; *H.A.*, 12: 1012). Several treatments are described which cause the buds to remain for certain periods in a stage not injured by a temperature of 28° F., among them lanoline emulsion applied by itself. The most marked prolongation of dormancy was achieved by two applications of 0·25% α-naphthalene acetamide in a lanolin emulsion made about 30 and 15 days prior to bud expansion. Since, however, every treatment that delayed blossoming was found to cause injury to the buds, the authors have been unable to make any suggestions for practical orchard use.

806. Johnston, F. A., Jr., and Sell, H. M. 633.85: 581.192

Changes in chemical composition of tung kernels during germination.

Plant Physiol., 1944, **19**: 694-8, bibl. 19.

This paper is from the U.S. Field Laboratory for Tung Investigation, Florida. Uniform samples of 25 seeds from 1,000 *Aleurites fordii* seeds planted were examined at planting time and at three different stages of germination. The first step towards germination is the absorption of water by all the tissues. The reserve sucrose in the seed is utilized rapidly throughout germination. The oil is the principal reserve food material in the tung kernel and gives rise to reducing sugars and starch, which form rapidly at the time of high lipase activity and are accompanied by the formation of free fatty acids. This suggests that the glycerides of tung oil are hydrolysed before being converted into carbohydrates. The protein reserve is hydrolysed throughout the germination period to give soluble nitrogenous products.

807. Dickey, R. D. 633.85-2.19: 546.72

A preliminary report on iron deficiency of tung in Florida.

Bull. Fla agric. Exp. Stat. **381**, 1942, pp. 20, bibl. 9.

A small percentage of trees in 3 Florida tung orchards was observed to suffer from iron deficiency. It is the primary object of the bulletin to give a detailed and illustrated description of the symptoms associated with this trouble in order to facilitate its differentiation from bronzing (zinc deficiency) and frenching (manganese deficiency). Secondly, experimental results are reported which show that the disorder will yield to foliage spray treatment (two applications in April or May and June or July) with a 1% iron sulphate solution or—less conclusively—to a soil application in April or May of iron sulphate at the rate of ¼-2 lb. per tree, according to size. If no response to the soil application is obtained by midsummer, the treatment should be repeated and, if necessary, be followed by foliage treatment. Iron deficiency was found to occur in soils with both acid and alkaline reactions.

808. Fernandes e Silva, R. 634.651

O mamoeiro e a papaina. **(The papaw and the extraction of papain.)**

Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **205**, 1944, 3rd edit., pp. 15, bibl. 9.

The cultivation of the papaw in Brazil is described, and instructions are given for extracting and preserving the papain, either wet or dry. There is an illustrated note on the construction of a small box oven for drying the latex. There are a number of named varieties which enjoy a good reputation in Brazil, and which come fairly true from seed. Papayas bought as plants are often of unknown origin and generally unsatisfactory. Cool, rich soils are the most suitable. An example is given of 2 trees of the variety Cawnpore; one in rich soil and under some shade produced 148 fruits yielding 428 g. of papain, the other, in poor ground and full sun, only 56 fruits and 96 g. of papain. A list is given of pests and diseases and the parts of the tree that each attacks.

809. Ruehle, G. D. 634.653-2.42

(1) **Cause and control of *Cercospora* spot and of anthracnose of the avocado.**

Pr. Bull. Fla agric. Exp. Stat. **583**, 1943, pp. 4.

TROPICAL CROPS.

810. Cooper, W. C., and Stoutemyer, V. T. 577.15.04: 551.566.1: 631.535
Suggestions for the use of growth substances in the vegetative propagation of tropical plants.
Trop. Agriculture, Trin., 1945, **22**: 21-31, bibl. 82.
A rapid method of propagating superior strains of tropical plants in order to build up clones available to commercial growers is urgently needed. Cinchona and lonchocarpus are cited as but two of the crops in which individuals have been isolated giving phenomenal yields. There are many others and many disease-resistant strains, all of which need to be vegetatively propagated before they can be grown commercially. The present paper is compiled for the convenience of investigators, more especially those of the office of Foreign Agricultural Relations (U.S.A.) and of other organizations concerned with agricultural research in Latin America. Special emphasis is placed on problems which are peculiar to the propagation of tropical plants with the aid of growth substances. Concentrations vary with the species itself, type and condition of wood, method of application, rooting media and environmental conditions. The compilers, both of whom have done original work on the subject, have produced here a manual in miniature, which is entirely practical and amply documented. Workers will find it prolific of ideas and probably extremely useful.

811. Wilson, F. B. 633/635(678)
Emergency food production in Zanzibar.
E. Afr. agric. J., 1944, **10**: 93-100.
The story is told how Zanzibar, until 1941 entirely dependent upon imported foodstuffs, attained a high degree of self-sufficiency without impairing the interests of the all-important clove industry. The expansion of such crops as rice and other grains, cassava, sweet potato, pulses, bananas and plantains receives a more detailed treatment.

812. Honig, P. 631.8(92)
The use of fertilizers in the Netherlands Indies.
Emp. J. exp. Agric., 1945, **13**: 54-9.
In order to assess the fertilizer needs for the reconstruction of the Netherlands Indies a survey is here made of the position before the war, which reveals that, particularly in the case of native owners, plantation crops in the Dutch East Indies have received comparatively low fertilizer applications. Tables show the annual consumption of imported fertilizers and their distribution in native agriculture and on European-owned estates. Modes of application are also discussed.

813. Vachhani, M. V. 631.67
Development of agriculture under perennial irrigation in Sind.
Ind. Fmg, 1944, **5**: 261-6.
Following the opening of the Lloyd Barrage canals in 1932 the acreage under cultivation in the province of Sind has enormously increased as a result of perennial irrigation from the Indus. The Agricultural Department recommends the inclusion of "rabi" oilseeds in the cropping system, in order to extend the sowing period to 3 months. The oil crops suggested are: toria (*Brassica campestris* var. *toria*), jambho (*Eruca sativa*), rape-seed and mustard.

814. Rawitscher, F. 581.11
Observações sobre transpiração de plantas brasileiras. **(Transpiration of Brazilian plants.)** [English summary 18 l.]
Ceres, 1943, **5**: 2-16, bibl. 15.
The stomatal transpiration of plants under Brazilian conditions can reach such heights that a forest can evaporate a multiple of the evaporation of a lake of the same area. Scrub land uses less water than forest. The scrub condition is often brought about by fires on forest land and such lands will often be found to contain a soil moisture which the subsequent less luxuriant vegetation has not fully employed. Water consequently drains from these soils and impoverishes them by carrying with it nutrient salts, whereas in the forest the water and nutrients are taken up and the latter later returned to the soil by fallen leaves.

815. Cleare, L. D. 631.67
An improved water lift.
Trop. Agriculture, Trin., 1944, **21**: 214.
An improved model of the simple water lift described *ibidem*, 1940, 17: 192; *H.A.*, 10: 1431. The canvas belt, found to wear easily, is superseded by ropes run through the paddles. Knots made in the ropes on each side of the paddle keep the paddles in place. The present model is easier of construction by a person unskilled in the use of tools.

816. Hansford, C. G. 632.3/4: 634.771 + 633.682 + 633.492
Uganda plant diseases.
E. Afr. agric. J., 1945, **10**: 147-51.
For the first article of this series on sweet potato virus see *ibidem*, 1944, 10: 126-7, *H.A.*, 15: 267. II. *Bananas.* By far the most important trouble of bananas in Uganda is their neglect for the sake of cash crops. This is particularly true in the Baganda, where sweet potato has become the major food crop. Actual diseases, of which the following are discussed with their control measures, are causing but little damage, provided sufficient care is given the banana fields: Stem rot (*Marasmius semiustus* and *Armillaria mellea*), leaf spot (*Cercospora musae*, *Helminthosporium torulosum*, *H. musae-sapientium*), fruit rot (*Gloeosporium musarum* and others). III. *Cassava.* Mosaic has become so prevalent that it is hardly worth while to continue the cultivation of susceptible varieties, but the propagation of resistant varieties, which it has been possible to secure, is proceeding fast. These new varieties have the additional advantage of being resistant to *Bacterium cassavae*. *Cercospora henningsii*, the causal organism of another leaf spot disease, is of no economic importance. The same applies to wilt (*Verticillium dahliae*) and tuber rots (*Armillaria mellea* and a species of *Helicobasidium*), which are also dealt with. IV. *Sweet potato.* Since writing his first article (see above) the author has made a brief study of the virus disease at the Mulungu Experiment Station of I.N.E.A.C., Kivu, Belgian Congo. The differences in symptom expression are discussed. At Mulungu, a large planting of seeds collected from native varieties has not produced one immune seedling; the degree of tolerance in any of the seedlings has not yet been determined. Two wild types of *Ipomoea* have proved susceptible to the virus, one showing severe infection. Stem disease (*Plenodomus destruens*), charcoal rot (*Rhizoctonia bataticola*) and leaf spot (*Cercospora* sp.) are also described, only the first named being of some economic importance in certain districts.

817. Moore, R. H. 632.951
Derris grows in America.
Agric. Amer., 1945, **5**: 10-12, 16, 18.
The story is briefly told how between 1 January, 1942, and 1 July, 1943, more than two million derris cuttings and plants were introduced (by air) from the Federal Experiment Station, Mayagüez, Puerto Rico, into 18 Latin American countries, of which Guatemala and Ecuador received more than half the total number. Most of the plants were of the Sarawak Creeping variety of *Derris elliptica*. On two survey trips undertaken by the author several regions were found that answered most of the requirements for successful derris cultivation, but the Pacific watershed of Guatemala scored highest on all points. It is believed that the growing of derris will not be discontinued in America after the end of the war.

818. Cooper, W. C. 632.951: 631.535: 577.15.04
Vegetative propagation of derris and *Lonchocarpus* with the aid of growth substances.
Bot. Gaz., 1944, **106**: 1-12, bibl. 7.
Large quantities of small derris and *Lonchocarpus* stems being discarded as useless in field plantings, it seemed desirable to work out a hormone treatment, which would stimulate the rooting of cuttings and thus facilitate vegetative propagation in commercial production. The investigation was carried out by the Foreign Agricultural Relations, U.S. Department of Agriculture at the Puerto Rico Experiment Station, Mayagüez, where extensive collections of both plants have been assembled. It was found that treatment of leafy cuttings with indolebutyric acid, α-naphthaleneacetic acid and α-naphthalene acetamide at concentrations of 1 and 2 mg./ml. had an excellent effect on rooting, while no benefit was derived from indoleacetic acid. Rooting of leafy *Lonchocarpus* cuttings made from the vine-like growth at the tops was also stimulated by growth substances. No treatment was required for the rooting of *Lonchocarpus* leaf-bud cuttings. With leafless cuttings, the rooting response produced by growth substances was very pronounced, but it was always accompanied by complete bud inhibition. This may be due to the drain on stored food materials in the absence of photosynthesis resulting from the induced formation of 50 or more roots on a single cutting. It is suggested that the use of more dilute solutions, producing only a slight increase in the number of roots, might be a means of avoiding the ill after-effects of a growth hormone treatment of leafless cuttings. A number of photos show the difference between treated and untreated material.

819. Occhioni, P. 632.754: 632.951
Da raiz de *Tephrosia toxicaria* Pers. e do seu aproveitamento no combate ao *Tenthecoris bicolor* Scott. **(The control of the plant bug *Tenthecoris bicolor* by the use of *Tephrosia toxicaria* root.)**
Rodriguesia, 1943, No. 16, pp. 55-61, bibl. 5.
An extract of the non-woody roots of *Tephrosia toxicaria* growing in the Botanic Gardens at Rio de Janeiro was successfully used as a spray against the plant bug *Tenthecoris bicolor*, which causes some damage by puncturing the leaves of orchids in the garden. The illustrations include one of the insect and of the *Tephrosia*. The technique in preparing the extract is described.

820. Tibyriçá, I. W. 633.52
A industrialização das fibras texteis liberianas. **(Cultivation and processing of certain stem fibre plants in Brazil.)**
Publ. Serv. Inform. agric., Rio de J. (*S.I.A.*), unnumbered, 1942, 2nd edit., pp. 21.
The publication gives a full account of the production and processing of the perennial woody fibre plant *Hibiscus bifurcatus*. Jute, *Urena lobata* and *Hibiscus cannabinus* are mentioned as being successful but less popular, because, for climatic reasons associated with retting, they are more trouble to deal with.

821. Gupta, J. C. S., and Sen, N. K. 633.523: 612.014.44
On photoperiodic effect of jute plants.
Ind. J. agric. Sci., 1944, **14**: 196-202, bibl. 11.
The two species of jute, *Corchorus capsularis* and *C. olitorius*, studied at Presidency College, Calcutta, responded to a light period shortened by 3 hours with earlier flowering and fruiting associated with a short and bushy growth. It is suggested that the induction of early flowering in jute may be useful for seed growers and breeders. There appears to be also a possibility of lengthening the vegetative development by long day treatment which may prove beneficial to fibre production.

822. Valle, E. L. 633.526.2(728.1)
Plantas que pueden explotarse para fibra en Guatemala. **(Possible fibre plants of Guatemala.)**
Rev. Agric. Guatemala, 1944, **21**: 103-10.
Concerns the cultivation of *Agave rigida*, or henequén. There is a brief mention of *Agave sisalana*, sisal, which differs from henequén in colour and in having no spines on the foliage.

823. McClure, F. A. 633.584.5
Bamboo culture in the Americas.
Agric. Amer., 1945, **5**: 3-7, 15-6.
The threatening depletion of oriental bamboo supplies has aroused extensive interest in the American production of bamboo, which western ingenuity has put to many untraditional uses. Scientific data on bamboo growing in the West are scarce, but what knowledge there is, is summarized in this article. Suggestions are made for the selection of suitable genera for cultivation in different areas and propagation methods, both seed and vegetative, are described. Vegetative propagation may be carried out by division or by branch or rhizome cuttings. Moisture, soil and fertilizer requirements for the production of edible shoots and for industrial purposes are discussed. The desirability of research into such problems as the optimum pH value and the use of growth substances in propagation is stressed.

824. Hardy, F. 633.61: 581.144.2: 631.417.2
The contributions made by sugar-cane roots to soil organic matter.
Trop. Agriculture, Trin., 1944, **21**: 203-9, bibl. 5.
Cane trash contributes more than twice as much humus to the soil (21 cwt. per acre) as cane root residues.

825. Craig, N., and Halais, P. 633.61-1.8
Le diagnostic foliare . . . **(Leaf diagnosis as a method of determining the nutrient requirements of sugar cane.)**
Rev. agric. Maurice, 1944, **23**: 120-32.
Trials at Reduit, the results of which are here concisely and graphically set out, indicate the great utility of leaf diagnosis to the sugar cane grower.

826. De Faria, G. 633.68(81)
Novas fontes de produção alcool para o Brasil. **(New sources of alcohol in Brazil.)**
Ceres, 1943, **4**: 151-68.
Various starch-bearing plants are considered as possible sources of alcohol in Brazil. Cassava is one of the best. It is widely grown, not exacting as to soil, gives a high yield of tuber for the space occupied and has few pests or diseases. In certain districts, which are named, millet is produced at a low cost and could be employed without prejudice to its principal local use for fattening pigs and other livestock. Rice, extensively used for the purpose in the Far East, is too costly in Brazil. Potatoes are too little grown, but even if large areas were established the yield would still be inferior to that of cassava. The process of manufacture is discussed at some length.

827. Graner, E. A. 633.682-1.521
Uma forma tetraplóide de mandioca vassourinha de provável valor hortícola. **(A new tetraploid form of *Manihot utilissima* of possible garden value.)** [English summary 9 l.]
Rev. Agric. S. Paulo, 1944, **19**: 380-91, bibl. 15.
Two tetraploid clones of cassava were obtained by colchicine treatment. One of them proved to be a dwarf, which although unsuitable for field cultivation shows distinct possibilities as a useful plant for small gardens.

828. Bond, T. E. T. 633.72-2.8
The "phloem necrosis" virus disease of tea in Ceylon. II. Field observations and effect on yield.
Ann. appl. Biol., 1944, **31**: 300-10, bibl. 10.
For a description of phloem necrosis of tea in Ceylon see *ibidem*, 31: 40-7; *H.A.*, 14: 876. The disease is evidently

spreading, but not below 4,000 ft. elevation. From this level, however, intensity and rate of spread tend to increase, the total incidence above 6,000 ft. being at least 20-25%, possibly much higher. Observations on existing old tea show that low *jât* types have principally become affected, but also there is a tendency towards deterioration of *jât* as a result of infection, while the young high *jât* supplies have so far exhibited no signs of disease. The only method of control attempted up to date is the removal of diseased bushes and their replacement by supplies. Though expensive, this measure has produced satisfactory results on many estates. The remarkable fact that on two estates, which furnished the figures for this calculation, the elimination of necrotic bushes was not accompanied by a decline in yield is the subject of comment. It is believed that the effect of thinning out on the remaining bushes and the progressive yields of the replacements have compensated for the loss from roguing. It must further be considered that the necrotic bushes had a productivity well below the average. The distribution of diseased bushes in the plantation is irregular and the rate of spread in different areas is highly variable. By roguing all necrotic and suspected bushes at 6-monthly intervals the rate of spread was reduced to about one-third of that in unrogued plots. The mechanism of spread remains unknown.

829. SMEE, C. 633.72-2.78
Bagworms in tea.
Nyasaland agric. quart. J., 1945, **5**: 1: 1-5.
Bagworms, which are described, must be regarded as a potentially dangerous lepidopterous pest of tea in Nyasaland. The so-called pagoda type seems to be the commonest, but the straight stick or lictor type is also of fairly common occurrence. Both attack the bark of young shoots apart from feeding on the leaves. The formation of collecting gangs after pruning, where necessary, is the control measure suggested.

830. GILLETT, S. 633.73
Summary of the annual report on cultural work conducted by the Coffee Services of the Agricultural Department during 1943.
Mon. Bull. Coff. Bd, Kenya, 1944, **9**: 108-10.
Some remarks on general conditions in the Kenya Coffee industry during 1943 and on meteorological data during the same period are followed by a summary progress report of the year's experimental work carried out at the Scott Agricultural Laboratories and at the Kitale and Karimani Experiment Stations. *Size of planting holes.* A 3 ft.× 3 ft. hole was consistently superior to smaller sizes. *Pruning*: weather conditions having been so abnormal, no importance should be attached to the results which would suggest that the multiple stem and the controlled single stem systems are inferior to the uncontrolled single stem system. In normal climatic years these results may be confidently expected to be reversed. *Mulching* proved beneficial, provided the material was applied early enough (September). The great benefit derived from *spraying* is again evident from the data presented. The results further show that the treatment is most important at higher altitudes and that two applications should be made (March/April and May/June) where fog spraying is practised. *Manurial experiments* have stressed the importance of nitrogen, the significance of which may have been underrated. Work on *selection* for types resistant to coffee berry disease and Elgon die-back is being conducted at Kitale, while trees selected for yield are propagated at the Scott Agricultural Laboratories, whose records indicate that high yielding is a character transmitted by grafting.

831. GILLETT, S., AND OTHERS. 633.73
A policy for improved husbandry on coffee estates.
Mon. Bull. Coff. Bd, Kenya, 1944, **9**: 119-21.
Recommendations are made by the Coffee Research Committee for the improvement of Kenya coffee estates which have lost much of their former vigour owing to exceptional climatic and war conditions. For this purpose the Colony is divided into three specific areas and recommendations are made for each. (1) *Areas east of the Rift at the lower altitudes.* These require immediate attention, improvement of the soil being of paramount importance. In view of the general shortage of manure it is suggested that a mulching programme be commenced at once. (2) *Areas east of the Rift at the higher altitudes.* These have not suffered much. Experiments have shown that mulching does not give such good results as at lower altitudes. (3) *Areas west of the Rift.* Here it is suggested that coffee should be grown as a portion (from 10 acres upwards) of a mixed farm only. Mulching in September has proved beneficial.

832. MACHADO, V. 633.73
Classificação do café. (**Grading coffee.**)
Ceres, 1943, **5**: 141-6.
A method of classifying and grading coffee for type and quality, working with samples of 300 g., is described in detail.

833. GUISCAFRÉ-ARRILLAGA, J., AND GÓMEZ, L. A. 612.014.44: 633.73
Effect of solar radiation intensity on the vegetative growth and yield of coffee.
J. Agric. Univ. Puerto Rico, 1942, **26**: 73-90, bibl. 13.
A comparison of the effect of 4 different sunlight intensity treatments on *arabica* coffee was made at the Puerto Rico Agricultural Experiment Station, Mayagüez, where a lath frame was erected to provide for ⅝, ½ and ⅓ solar radiation and full sun exposure. For the duration of the experiment, from 1936 to 1939, four ecological factors were observed, namely solar radiation, air temperature, relative humidity and soil moisture. The last was the least fluctuating of all factors, since greater evaporation under full exposure was compensated by greater transpiration from a larger leaf area under shade. Sunlight was found to have a distinctly formative influence on coffee, making for very weak, chlorotic and poorly developed plants. The full sunlight plots received an average per year of 144,754·40 gr. cal./cm² as against the plots under ½ exposure, which received 32,291·54 gr. cal./cm²; the optimum of 53,143·20 gr. cal./cm² per year was obtained under ½ exposure. Yields and growth being negatively correlated with solar radiation, the plants grew best under ½ and ⅓ sunlight. Growth and yields were found to be positively correlated, but there was no difference in yields between ½ and ⅓ exposure plots, although the latter made significantly more growth. There was a negative correlation between temperature and yield and a positive correlation between yield and relative humidity. According to the records solar radiation varied widely with season and year, but shade tended to equalize the amount received under ⅝, ½ and ⅓ exposure. Under full radiation the accumulation of potash and nitrogen was greater and that of phosphorus lower than in the shade. In conclusion, the planting of guaba trees (*Inga inga*) at not less than 16× 16 ft. is recommended to provide the optimum shade conditions.

834. GILBERT, S. M. 633.73-1.535
Rooting cuttings of *Coffea arabica*. A cost analysis.
Trop. Agriculture, Trin., 1944, **21**: 209-10.
Accounts are presented from which it is seen that the cost at the Coffee Research Station, Tanganyika, of producing a rooted cutting of coffee is 4½d. A cutting made from year-old wood will fruit in 2 years against the 3 years required for seedlings. The yields from rooted cuttings have reached 9 cwt. per acre in the third year, the average yield for all coffee in Tanganyika Territory being 2⅔-3 cwt. per acre, a figure which the cuttings reached in their second year.

835. MENDES, A. J. T. 633.73: 581.163
Sementes de café poliembriônicas e desprovidas de embrião. **(Polyembryonic and embryo-less coffee seeds.)**
Bol. Superintend. Serv. Café S. Paulo, 1944, **19**: 618-20, bibl. 2.

Occasionally apparently polyembryonic coffee seed is noticed. This may be real polyembryony or so-called false polyembryony. The latter term is used when two or more seeds are found packed within a single parchment. Actually they are separate seeds each with its own embryo. Cases are also known when true and false polyembryony are combined and seeds have been found without any embryos at all, but so far only in the *arabica* variety known as Bourbon. Percentages are given for a number of coffee varieties, thus Bourbon *arabica* shows 8·8% false, 0·8% true polyembryony and 1·2% without embryo; *canephora* 0·3% false, 0·4% true; *liberica* 4·2% false, 4·3% true. Seedlings of true polyembryonic origin have been planted out for further study.

836. ALVARADO, J. A. 551.571: 633.73-2.19
As chuvas e a sua relação com a queda do café-cereja. **(The relation of rainfall to cherry drop in coffee.)**
Rev. Dep. nac. Café (*D.N.C.*) *Rio de J.*, 1944, **23**: 367-71, being reprinted from *Rev. Inst. Defensa del Café, Costa Rica*, Feb. 1944.

The effect of rainfall on cherry drop in coffee is discussed. The critical phases in the cherry's development are described and the reasons for them are given. To prevent excessive cherry drop in Costa Rica the crop should be picked before it has passed maturity, the grove should be adequately shaded and maintained in vigour. The too rapid ripening of unshaded coffee is a frequent source of cherry fall.

837. BERGAMIN, J. 633.73-2.76
A broca do café, problema nacional. **(The coffee borer, a national problem in Brazil.)**
Rev. Dep. nac. Café (*D.N.C.*) *Rio de J.*, 1944, **23**: 337-42.

A review of the coffee borer (*Stephanoderes*) problem as it affects the various provinces of Brazil and the means by which it obtains or has obtained entry or continues to spread. In a short time, at the present rate of increase, there will be no coffee zone in Brazil free from this borer.

838. MELVILLE, A. R. 633.73-2.73
Control of coffee thrips.
Mon. Bull. Coff. Bd, Kenya, 1944, **9**: 123-5.

In view of the urgency of the problem preliminary results are published of trials, which were conducted for a season at the Karimani Experiment Station, with the object of testing a spray mixture for the control of coffee thrips (*Diarthrothrips coffeae*). A formula is recommended that combines a markedly depressing effect on thrips populations for 3 weeks, with a minimum of leaf scorch: Finely ground fresh lime, 1½ lb.; paris green, 8 oz.; molasses, 10 pints; water, 40 gal. Spraying should start when there is a thrips count of 300 per 100 leaves. It is reckoned that 3 applications at intervals of 3 weeks will suffice to control the pest even in a very bad season. Further research is required to determine the minimum concentration necessary and to test combinations of the paris green-molasses spray with bordeaux or burgundy mixtures. It is hoped that trials with D.D.T. will soon be possible.

839. LE PELLY, R. H. 633.73-2.754
Control of *Antestia* and *Lygus*.
Mon. Bull. Coff. Bd, Kenya, 1944, **9**: 131.

The article is an extract from the author's earlier paper "Note on the rational application of control measures for certain insect pests of coffee, on data obtained by native observers", *Bull. Dep. Agric. Kenya* 22 (second impression 1933). It is brought again to the attention of growers, because a general adoption of the method recommended would effect a considerable economy in pyrethrum and cost. The suggestion is that the number of different insects on trees selected at random be ascertained as a daily routine measure by native observers, who spray the trees, with a kerosene extract of pyrethrum and count the dead insects dropped on "americani" sheets on the ground. A ten-acre block should be tested once a week. When the number of *Lygus* reaches 4-5 to a tree and that of *Antestia* 2 to a tree the block should be sprayed.

840. (LEROY, J. V., HENDRICKX, F. L., AND LEFEVRE, P. C.) 633.73-2.754
Les Antestia spp. au Kivu. **(Collected papers on *Antestia* spp. in Kivu, Belgian Congo.)**
Publ. Inst. nat. Étude agron. Congo Belge (I.N.E.A.C.) *Ser. sci.* **26**, 1942, pp. 69, bibls., 50 Fr.

The translated titles of these papers are:—1. Contribution to the study of injury caused to *arabica* coffee by *Antestia* (Leroy and Hendrickx). 2. *Colletotrichum* or *Antestia*? (Hendrickx). 3. A new type of *Antestia* injury; total or partial castration of the flower buds (Hendrickx). 4. Recent observations on *Antestia* (Lefevre and Hendrickx). 5. Field studies of *Antestia* prox. *lineaticollis* Stal (Lefevre). Appendix A. Pyrethrum powder, the most popular insecticide in use in Kivu (Lefevre). Appendix B. Economic study of pyrethrum treatments (Lefevre).

841. BAGUENA, L. 633.81-2.78
Un grave peligro para el ylang-ylang en Fernando Póo. (*Bunaea alcinoe* (*Lepidopt. Saturnidae*) **attacking *Cananga odorata* in Fernando Po.)**
Bol. agric. Territ. Españ. Golfo de Guinea, 1943, semester 1, pp. 27-48.

Spraying with stomach poisons and hand picking provide a good means of controlling this pest of cananga. Its life history is described and illustrated, partly in colour.

842. FERNANDES E SILVA, R. 633.854
Notas sôbre a cultura da oiticica. **(Oiticica nuts (*Licania rigida*) and their cultivation.)**
Publ. Serv. Inform. agric., Rio de J. (*S.I.A.*) **559**, 1943, 2nd edit., pp. 13, bibl. 7.

The oiticica nut grows naturally in riverine forest in north-east Brazil at altitudes of from 150 to 1,000 ft. above sea level. For maximum yield and growth the tree requires a high (80-100° F.) temperature, strong light and a high humidity during the maturing of the fruit, though rain during flowering is prejudicial to fruit set. A deep, rich, well-drained alluvial soil, well supplied with potash and with pH about 7 is recommended. Propagation is by seed, but experimental budding and grafting proved successful when skilfully done. The method of grafting is that used for the mango [apparently inarching is meant.—ED.]. The stock should be 4 to 6 months old and of 6 mm. diameter at the point of union. Top grafting has also succeeded but budding is likely to prove the best method for large-scale propagation. Diameter of the budwood used experimentally was 3 to 9 mm. The earliest buds began to shoot 25 days after insertion and the latest within 80 days. The stocks were 7 months old from seed. Plants should be retained in the nursery for a year after budding. The Ministry of Agriculture or one of the associated services is carrying out further budding experiments. The officially recommended planting distance is 10 to 15 metres in square or in quincunx. Cultivation presents no unusual features. Pruning methods for framing young budded trees are still to be studied. Irrigation is practically essential in all but damp situations since drought, while not harming the trees, almost entirely prevents fruiting. Catch crops can be grown beneath the young trees. The weevil *Conotrachelus lateralis* has been recently reported attacking the nut. Instructions are given for dealing with it. The fallen nuts must be picked up at once to prevent the weevil entering the ground where it

pupates. It is suggested that cloths should be placed under the trees on which the nuts can fall. Gathered nuts should be processed at once or stored in containers from which the insect cannot emerge. If processing is long delayed the nuts should be fumigated. Hot water treatment is also suggested but its effect on oil extraction is not known. The nut contains 50% of an oil useful for various industrial purposes not further specified. The wood of the tree is easily worked and has great durability.

843. GÓMEZ-MORENO, M. L. 633.88
Notas y aclaraciones sobre las plantas llamadas "iboga" y "kinkeliba". **(Notes on *Tabernanthe iboga, Cassia occidentalis* and *Combretum micranthum* in Spanish Guinea.)**
Bol. agric. Territ. Españ. Golfo de Guinea, 1943, semester 1, pp. 49-59, bibl. 16.

The plants mentioned in the title are natives of parts of West Africa. *Tabernanthe iboga*, known as iboga in Spanish Guinea and under variations of this name in neighbouring territories, is used as a stimulant in promoting energy for marching, dancing or as an aphrodisiac. Small pieces of root are chewed. Overdoses are toxic. An alkaloid known as ibogain ($C_{26}H_{32}O_2N_2$) has been isolated and has been used in pharmacy for nervous and cardiac disorders. Dosage and other particulars are given. The plant is not regularly cultivated but a few plants are usually maintained near the native huts. Propagation is by seeds or cuttings. *Cassia occidentalis* is known as kinkeliba in Spanish Guinea (derived from the Spanish attempt, "stinkiliba", at the English name "stinking leaves"). It is a common plant occurring in most village clearings and is much used in native medicine in cases of fever and as a cure for Guinea worm. *Combretum micranthum* is common on the West Coast but less so in Spanish Guinea. It is described as the true kinkeliba. It is chiefly used in bilious disorders involving haematuria. Administration is mainly by infusion of the leaves.

844. DE BARROS, P. P. 633.88
A ipecacuanha. **(The cultivation, extraction and marketing of ipecacuanha, *Cephaelis ipecacuanha*.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*), unnumbered, 1942, pp. 21, reprinted from *Bol. Minist. Agric. Rio de J.*, January 1942.

Ipecacuanha is a native of Brazilian forests, whence it is obtained by native contractors under strict government regulations as to close season and methods of collecting, often disobeyed. In order to encourage commercial plantings growers are given a subsidy of 300 dollars per hectare, or 200 dollars if the plantation is in a district where wild ipecacuanha is common. Twenty per cent. reduction in export duty is also granted to any individual or firm exporting more than 500 arrobas (1 arroba=32 lb.) of cultivated ipecacuanha per annum. The bulletin gives an interesting account of the methods and mode of life of the native collectors. Seed deteriorates rapidly and plantations are best made from stems and false rhizomes planted at the beginning of the rains. Sandy or sandy clay soils, provided they are rich in humus, will suit. A light soil makes harvesting easier with the simple iron-shod stick, which is the usual tool for levering the plant from the soil. The discarded stumps and part of the false rhizomes are thrown on the ground in wild plant collecting, where, under the shade of the woods, they take root and regenerate. Hence a regulation forbidding collection in the dry season. Ipecacuanha growing under evergreen trees maintains its foliage throughout the year, in deciduous woods it loses it at the same time as the trees shed theirs. Formerly it was found in colonies of 200 to 500 plants, but now, largely owing to clandestine collection in the forbidden dry season and before they have seeded, colonies of even 50 plants are rare. The seed is widely distributed by birds which eat the berries with avidity.

845. LOPES, L. S. 633.88.11.871
Instruções para a cultura dos eucaliptos. **(Cultivation of eucalypts.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **812**, 1944, 3rd edit., pp. 33.

The cultivation and uses of various species of *Eucalyptus* suitable for Brazil form the subject of this paper. An original and useful feature is the classification of all the chief species according to the environment most suited to them or at least in which they can be expected to succeed. Thus lists are given of eucalypts which succeed in the tropical, the temperate, the colder regions, of those which resist drought and those which do not, of those suitable respectively for rich, poor, dry or wet soils. Other conditions for which accommodating varieties are named are marshland, wet sandy, dry sandy, calcareous, granitic, ferrugineous, basaltic, salty, coastal, clay, and stony soils and open country or sheltered valley. There is a further selection made of those which possess useful commercial possibilities and are especially suited to climatic conditions in Brazil. Unfortunately the variety *robusta*, which is one most commonly grown, has an inferior wood. Eucalyptus flowers are attractive to bees and furnish honey of good quality, the flavour and appearance being influenced by the variety. To propagate on a large scale the seeds are sown in specially prepared beds or boxes and pricked out into boxes holding 80 plants when 5 to 10 cm. high. When 25 to 30 cm. high the plants are put out on their permanent site. They are transplanted direct from the boxes, which are taken to the field; some earth should be left on the roots of each plant. To make this easier one side of the box may be removed; the box must not be broken up as it can be used again. A useful planting distance is 2 m. apart each way. Instructions are given for maintenance, including the provision of anti-fire clearings. Attention is paid to methods of economizing labour. There are few pests, the worst being ants. A fungus which attacks young plants is easily dealt with by the use of hot sand.

846. CRANDALL, S., AND DAVIS, W. C. 633.88.51-2.411
***Phytophthora* wilt and stem canker of *Cinchona*.**
Phytopathology, 1945, **35**: 138-40, bibl. 5.

In Central and South America observations of *Phytophthora* infections of *Cinchona pubescens*, *C. officinalis* and *C. pitayensis* have been made which indicate that the disease will be of economic importance in the American tropics, where symptoms are not confined to seedlings but appear also on grafted stock and mature and semi-mature plantation trees, causing canker and dieback. The symptoms were readily reproduced by inoculations with a fungus isolated from a diseased tree and tentatively identified as *Phytophthora parasitica*. A certain measure of control is reported from different countries by means of (1) eradicating wilted seedlings from the beds, (2) cutting back the tops of infected grafted stock to well below the dead tip, (3) regular applications of a copper spray containing a good sticker. The selection of resistant clones of high alkaloid content appears to be promising.

847. STANWOOD, E. T. 633.912
***Hevea* rubber comes to Honduras.**
Agric. Amer., 1944, **4**: 227-8.

A brief account on the activities of the co-operative rubber station at Lancetilla, Honduras, set up by the U.S. Department of Agriculture, the Government of Honduras and a private company to establish and to further *Hevea* plantations along the northern coastal areas of the country.

848. NOSTI, J. 633.912: 633.74
La utilización de heveas empleadas como arboles de sombra. **(Use of *Hevea* planted for cocoa shade in Fernando Po.)**
Bol. agric. Territ. Españ. Golfo de Guinea, 1943, semester 1, 1943, pp. 7-25.

There are no regular plantations of *Hevea* in Fernando Po,

but there were in 1943 7,550 young trees and 3,250 producing trees mostly planted as shade for cacao. Ordinarily these do not pay to tap but with the rising price of rubber due to war conditions the case is altered. There seems to be no reason other than financial why *Hevea* should not succeed as a plantation crop and the article is devoted to discussing its cultural requirements, methods of tapping, diseases, etc. *Hevea* as a shade tree does not exhaust the soil, but for various reasons, which are discussed, it is not a tree to be recommended for the purpose, unless it is intended to exploit it for rubber. Even so it should only be planted in new cacao groves and not in established ones nor on old cacao ground that is being replanted.

849. ANON. 551.566.1: 634.1/7
Some tropical fruits and strawberries—Harvesting, packing and marketing.
Qd agric. J., 1944, **59**: 268-77.
The instructions on harvesting, sizing and packing for local and distant markets or for export relate to custard apples, papaw, *Monstera deliciosa* and strawberries. The article is supported by numerous photos illustrating various methods of packing.

850. WEBBER, H. J. 634.421: 581.192: 577.16
The vitamin C content of guavas.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 87-94, bibl. 9, being *Pap. Calif. Citrus Exp. Stat. Riverside* **515.**
Data collected at Riverside are here discussed. They do not suggest that flesh colour is in any material degree correlated with vitamin C content. Degree of acidity, as judged by taste, has apparently little or no influence on vitamin C content. The time of ripening does not seem to be strongly correlated with vitamin C content. There is a slight indication that within any clonal variety the early-ripening fruits will contain a lower concentration of vitamin C than its later-ripening fruits. Most of the evidence indicates that the vitamin C concentration is likely to reach its peak in the period between early ripening—when the fruits are still firm but are starting to go light yellow—and the time of full maturity.

851. FERNANDES E SILVA, R. 634.412
Notas sôbre a cultura da pinha. **(Cultivation of the custard apple, *Annona squamosa*, in Brazil.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*), unnumbered, 1941, pp. 7, bibl. 7.
The sugar or custard apple, a native of Brazil, does best in a deep, cool, sandy clay soil, with humus, or in alluvial soils. On impoverished land the young trees require manures and such lands dry out easily. Such conditions are apt to cause abortion of the flowers. The tree grows well on the coast close to the sea and inland up to altitudes of 1,500 ft. Good drainage is of especial importance. The usual method of propagation for large-scale planting is by seed; cuttings and grafts are only used occasionally. The author has had no experience of budding or grafting it but mentions that J. E. Dias Martins at the Estação de Pomicultura de Deodoro has grafted on stocks of beribá and anona do brejo [presumably these are species of *Annona*.—ED.]. R. Mayole of the Cuban Agricultural Service in *Cultivo de árvores frutíferas*, says that the stocks are ready for budding when they are 1 centimetre in diameter and that budwood should be leafless and ash-grey in colour [*A. squamosa* is quite easily budded by modified Forkert or shield methods on year-old stocks of the same species, using ripe, year-old non-petioled budwood.—ED.]. Planting is done during the rains or at any time on irrigated land in specially prepared holes, the spacing recommended being 4×4 or 5×5 metres. Cultivation consists of an occasional weeding. The larvae of a fruit moth, *Stenoma anonella*, caused much damage by boring into the fruit from eggs laid on its surface. Various methods of hand picking, spraying and trapping are suggested for its destruction. The chief fungus disease of the fruit is an anthracnose not further identified here. The remedies are picking off the diseased fruit and leaves and spraying 2 or 3 times at 15-day intervals with bordeaux, especially when the fruit is on the tree, and thinning out the denser tree tops to admit light and air. The fruit ripens in succession and has to be carefully clipped, not pulled, from the tree. Full bearing is reached in the 5th year, first bearing may begin in the 2nd year. An average of 100 fruits per tree is considered good.

852. FERNANDEZ E SILVA, R. 634.441
Notas sôbre a cultura da mangueira. **(Notes on mango culture.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **420,** 1944, pp. 11, bibl. 8.
Any climate in Brazil in which the temperature does not fall below 0° C. will suit mangoes. They have stood 12° of frost in Florida when in full leaf. A list of varieties grown in Brazil is given and the districts best suited to each. Although the mango can be seen growing in almost any soil it is at its best in well drained alluvial soils and in cool, sandy clay soils rich in humus and this especially refers to fruit quality. Propagation is from seed, by approach grafting or by budding. In grafting or budding the scion material should be selected from high-yielding branches. These operations are all described. The various other cultural treatments are briefly mentioned and do not differ from common practice. A number of pests and 2 diseases are listed but not described. The mango can be cold stored at 5° C. for 50 days without losing its quality, but there are varietal differences in reaction to storage.

853. UPPAL, B. N., AND WAGLE, P. V. 634.441-2.754
Control of mango hoppers in Bombay Province.
Ind. Frmg, 1944, **5**: 401-3.
The life history and distribution in Bombay Province of 3 mango hopper species, *Idiocerus atkinsoni*, *I. clypealis* and *I. niveosparsus* are described, the nymphs of which suck sap from mango flowers and buds and are responsible for heavy losses to the grower. Control consists in dusting the inflorescences with sulphur of 300-mesh fineness when the tree is in flower and then at 10 days' interval. In Konkan and Karnabak where the sulphur-susceptible *I. clypealis* is prevalent, 3-4 applications will give effective control, while in South Gujurat and the Bombay suburban area 8-10 dustings are required to control *I. niveosparsus*. The third species does not seem to be of economic importance. The applications should be made during the cool part of the day when the surface is not wet with dew.

854. MACHADO, O. 634.573
Estudos novos sobre uma planta velha o cajueiro (*Anacardium occidentale* L.). **(New studies on an old plant, the cashew.)**
Rodriguesia, 1944, No. 17, pp. 19-48, bibl. 184.
In the main an annotated bibliography of the cashew (*Anacardium occidentale*) with special reference to Brazil, and to its anatomy and physiology. The plant is protected in Brazil. A copy of the decree providing for this is given.

855. PORTO, H. 634.575
A noz do Brasil. **(*Bertholletia excelsa*, the Brazil nut.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **7,** 1943, pp. 19.
The Brazil nut grows wild in considerable numbers in Brazilian forests and is regularly exploited. The tree grows very slowly to a great height, over 150 ft., and does not begin to bear freely until its 15th year, though a few nuts may appear in the 10th year. The nuts require 15 months to ripen and fall. Because of the great size of the tree nuts can only be harvested by collection from the ground. It is customary to chop open the hard outer shell and remove the nuts within at the time of collection, an operation requiring considerable dexterity. Each outer shell contains

15 to 20 nuts. The nutrient value of the nuts is discussed: 100 g. of kernel furnishes 709 calories, 2 kernels equal 1 egg in nutrient value and 200 g. will provide the daily quantity of albuminoids required by the adult human. The composition of a kernel is given as 17% protein, 67% fats, 4% mineral salts, 7% carbohydrates and 5% water with 12·5% vitamins A and B and 1·5% vitamin C. For internal, commercial purposes nuts are graded into 3 sizes according to the number which can be contained in a 2-litre measure, large 94 nuts, medium 95-114, and small over 114. For export purposes the grades are large, large medium, good medium and medium, medium in this case being a trade euphemism for the smallest nuts. The grading process is at present primitive, slow and un-uniform and regulations have recently been issued laying down an official specification both for nuts and extracted kernels, in which the grades are determined by combinations of weight and number and are much more numerous. Bolivian merchants are said to bury the nuts for some months in order to keep them for the Christmas export market. This prevents desiccation and other deterioration but alters the appearance and flavour for the worse.

856. DE VIVEIROS, J. F. 634.6
O babaçú nos estados do Maranhão e Piauí. **(The babacu palm (*Attalea speciosa*) of Maranhao and Piaui States of Brazil.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **147**, 1944, pp. 43. Reprinted from *Bol. Minist. Agric. Rio de J.*, April 1943.
A review of the technical and economic possibilities of the cultivation and rational exploitation of the babacu palm of Brazil. The nuts furnish an excellent oil and the shells, when compressed into briquettes, a good industrial fuel. Other by-products are also mentioned. The palm should be brought into cultivation, for the yields are then much higher than those obtained from wild plants. The seeds take about 90 days to germinate and first bearing occurs from 7 to 12 years later. Methods of cultivation are as yet untried but there are at least 10 million hectares in the States of Maranhão and Piaui on which the palm could be successfully grown. The wild trees are consistently exploited and the bulletin concludes with commercial statistical tables and copies of a number of legal decrees on grading, storage, factories and other matters bearing on the trade.

857. GOMES, P. 634.61(81)
O coqueiro da praia. **(The coconut in Brazil.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*) **37**, 1944, pp. 120.
A very full study of the coconut palm, with special reference to Brazil. Certain authors and workers are mentioned by name but there is no bibliography.

858. DICKEY, R. D. 634.61-2.19: 546.711
Manganese deficiency of palms in Florida.
Pr. Bull. Fla agric. Exp. Stat. **576**, 1942 (reprinted 1945), pp. 4.
A manganese deficiency trouble of the plumy coconut palm (*Arecastrum romanzoffianum*), of which chlorosis of the leaves is the first symptom, and experiments aiming at its cure are described. A noticeable improvement after 3 months and a complete recovery by the end of 6 months was achieved by means of manganese applied to the soil or as a foliage spray, both methods being equally effective. In the case of soil treatment, which was given in March, April, May or August, ½ lb. to 5 lb. of 80-83% manganese sulphate per tree were applied by either of the three following methods: (1) Broadcasting under the spread of the top, (2) plugging (=inserting the chemical in holes 1 foot deep under the spread of the leaves) and (3) with palms growing in lawns, in a small cleared circle around the trunk (by plugging in the absence of such a cleared circle). A 1%-manganese lime spray was used for spraying. The experimental palms stood in alkaline soil, but it may be assumed that the treatment would be just as successful under acid conditions. Manganese deficiency in the Canary Island date palm (*Phoenix canariensis*) is also shown by chlorosis, particularly of the upper leaves, but the "frizzle leaf" condition characteristic of the further stages of the disorder in plumy coconut is lacking. The same treatment as that suggested for plumy coconut is recommended, though somewhat larger amounts of manganese sulphate should be applied. Similar disorders in *Roystonea regia*, *Livistona chinensis*, *Caryota urens* and *Acrocorina totai* are briefly discussed.

859. HAAS, A. R. C. 634.62-1.811.8: 581.192
Chlorine accumulation in date palm varieties.
Bot. Gaz., 1944, **106**: 179-84, bibl. 7.
The total chlorine content of the pinnae and fruit in the important Deglet Noor date palm was found to be lower than that in the many other date varieties tested. The samples for comparison were collected from widely separated soils covering a considerable range of chloride concentration and from individual gardens where different varieties grow under similar conditions. The chlorine content in the dry matter of Deglet Noor pulp (0·104-0·374%) is about 10 times that found in citrus fruits from orchards in high chlorine areas (0·025-0·04%). The investigation was carried out at Riverside.

860. BARNELL, H. R., AND BARNELL, E. 634.771: 581.192
Studies in tropical fruits. XVI. The distribution of tannins within the banana and the changes in their condition and amount during ripening.
Ann. Bot. Lond., 1945, **9**: 77-99, bibl. 32.
1. The distribution of tannin-bearing elements within the tissues of the Gros Michel banana fruit has been surveyed [at the Imperial College of Tropical Agriculture, Trinidad] and the changes in these elements during ripening observed. 2. A tentative method for the estimation of astringent tannins is described. The method depends on the diastase-inhibiting property of "free" or "active" tannin in aqueous solution. 3. Approximately four times as much "active" tannin was found in the skin as in the pulp of the freshly harvested banana. During storage the amount fell in both skin and pulp, particularly in the stage just preceding the attainment by the banana of the "sprung" condition. Small but approximately constant amounts remain in pulp and skin (about twice as much in the skin as in the pulp) during the eating- and over-ripe stages. 4. The pulp of abnormal ripe fruit (e.g. chilled fruit or fruit from *Cercospora* leaf-spot infected plants) contained a higher amount of "active" tannin than that of normal fruit. 5. The slow oxidation of crude banana tannins gives rise to colours similar to those observed in the pulp of fruit from *Cercospora*-infected plants and in the skins of chilled fruits. [Authors' summary.]

861. BARNES, H. 634.774(94.3)
Pineapple growing in Queensland.
Qd agric. J., 1944, **59**: 207-13.
The pineapple thrives in Queensland in the coastal strip from the southern border to the far north, where adverse slopes or cold westerly winds do not create unfavourable conditions. Although a fairly high regular rainfall is desirable, the crop can be grown in districts of moderate rainfall, if paper mulch is used for conserving the soil moisture. The author, Director of Fruit Culture, gives a detailed description of pineapple cultivation, dealing with the following subjects: Soils (pH 4·5-5), preparation of the land, planting material, storing suckers, slips and tops, planting, spacing, time of planting, cultivation and plantation management, fertilizing, improvement of type. Varieties grown commercially are the smooth leaf, the common rough and the Ripley Queen (also rough-leafed) varieties.

862. RIOLLANO, A. 633.61-1.87: 635.6
The value of filter press cake as a fertilizer for vegetable crops. Preliminary trials with tomatoes and cucumbers.
J. Agric. Univ. Puerto Rico, 1942, **26**: 99-104, bibl. 3.
Filter press cake, a refuse from sugar mills, was found to be a valuable fertilizer for tomatoes and cucumbers, whether applied by itself or in addition to NPK. The most profitable treatment for cucumbers under Puerto Rico conditions would appear to be 20 tons of filter press cake +200 lb. NH_3 and P_2O_5 per acre.

863. BOND, W. E. T. 635.976: 551.566.1
Hedge plants in Northern Nigeria.
Trop. Agriculture, Trin., 1944, **21**: 228-30.
An annotated list is given of the plants used as hedge plants or as fencing in the form of live stakes to which wire or wire netting can be attached. The trees *Azadirachta indica* and *Newbouldia laevis* should be avoided, since their roots grow near the surface and extend over a large area, causing patchiness in the crops and grasses growing above.

864. (CHAPMAN, V. J.) 667.211.4
Mangroves in the New World.
Nature, 1945, **155**: 212-3, bibl. 1.
A review of 3 papers by Dr. V. J. Chapman (*J. Linnean Soc.*, 1944, Vol. 52, No. 346). These papers derive from the work on mangroves carried out by the 1939 Cambridge Expedition to Jamaica and give a very full account of the main features of these plants. The reviewer (R. O. Preston) considers that a clear grasp is shown of the problems involved in attempting to relate morphological character to physiological function, that the repeated emphasis on the problems yet to be solved is wise and that the papers provide the necessary guidance for more detailed observation in the future. The first paper surveys the botanical processes involved in the maintenance and development of the shore line in Jamaica and discusses the ecological significance of the range of mangroves and associated plants found on the island. In the second an attempt is made to elucidate the edaphic factors important in the growth of the mangrove, *Avicennia nitida*. The third paper gives a thorough description of the developmental morphology of the same species from seedling to mature plant, aided by many line drawings

865. GLEGG, C. G. 612.3(689.63)
(5) **Native foodstuffs in Tanganyika. [Preparation and use.]**
Trop. Agriculture, Trin., 1945, **22**: 32-8, bibl. 3.

MARQUES, J. Q. A. 631.459
Controle da erosão. **(Erosion control.)**
Ceres, 1943, **5**: 121-34, bibl. 6.
Comprehensive but not new.

PIZA, S. DE T., AND ZAMITH, A. 632.78: 632.96
Contribuição para o conhecimento da organização e da biologia de *Brassolis sophorae* (Lep. *Brassolidae*) e seu parasita *Xanthozona melanopyga* (Dipt. *Tachinidae*). **(A note on the biology of the butterfly *Brassolis sophorae* [a pest of palms] and its tachinid parasite *Xanthozona melanopyga*.)** [English summary ½ p.]
Rev. Agric. S. Paulo, 1944, **19**: 204-20, bibl. 1.

TELLER, A. DE Q., Jr. 633.73: 581.056
Aclimatação e climas cafeeiros do mundo. **(Acclimatization and coffee climates of the world.)**
Bol. Superintend. Serv. Cafe S. Paulo, 1944, **19**: 1123-8, 1255-61, bibl. 12.

VIANNA, E. F. 635.977.2.736
Breves instruções sobre a cultura da bracatinga. **(Brief notes on the cultivation of *Mimosa bracatinga*.)**
Publ. Serv. Inform. agric. Rio de J. (*S.I.A.*), unnumbered, 1942, pp. 3.

PACKING AND STORAGE.*

866. HOLLOWAY, F. E. 634.11-1.564
Corrugated packages for apples.
A.R. Quebec pomol. Fruitgr. Soc. 1942, 1943, pp. 10-2.
The value of the wartime carton package for apples is discussed by a fruit broker who has to handle them. There are two sizes, to hold 65 lb. and 90 lb. respectively. An attractive pack is a layer pack with a piece of cardboard between each layer and a liner between each row. There is a wax liner inside the carton and each apple is wrapped in waxed paper. The condition of the fruit is described as perfect and with the bloom still on. Other packs are described. In none did the cost much exceed 20 cents per bushel including the carton. Careful handling is essential to success. The carton cannot be treated like a wooden box.

867. MICKLEM, T., AND DU PREEZ, D. 634.25-1.564
Further peach packing and grading experiments.
Fmg S. Afr., 1944, **19**: 789-93.
The work carried out at the Western Province Fruit Research Institute, Stellenbosch, during the 1943/44 season strongly confirms the results of the previous year (*ibidem*, 18: 873-9; *H.A.*, 14: 1375). Provided that wrappers are available, preference is given to the solid pack (wrapped) over the semi-nest pack (unwrapped), space and woodwool being used more economically. Other experiments showed that with either method the packing in *long* rows would be a further saving in space, while the danger of bruising due to pressure on the pliable sides of the tray appears to be lessened. The testing on a commercial scale of the long row packing style is recommended.

* See also 860.

868. BENDER, R. 664.85.11
Apple storage construction for the farm.
A.R. Quebec pomol. Fruitgr. Soc. 1943, 1944, pp. 63-70, bibl. 2.
Advice on the construction of buildings suitable for apple storage. Common stores should be constructed with an eye to their future conversion into cold stores. In planning a fruit store care should be taken to make it large enough. Most storage buildings are too small. The paper contains many practical hints on points of construction.

869. SMITH, W. H. 664.85.22.035.1
Some observations on the ripening of plums by ethylene.
J. Pomol., 1945, **21**: 53-6, bibl. 3.
At Ditton Laboratory plums were treated in air at 65° F. with various concentrations of ethylene ranging from 1/250 to 1/156,000. The varieties used were Myrobalan, River's Early, Czar, and Monarch. Ethylene accelerated change of colour, softening, and the development of "ripe-plum" odour. Sugar and acid contents were unaffected. The effects on odour and flavour were brought about by a very wide range of concentrations in one or two days. Abnormal colour change was brought about by concentrations of 1/250 and 1/31,000. The most marked effect of ethylene was the rapid softening of the plum.

870. MITCHELL, J. W., AND MARTH, P. C. 577.15.04: 664.85
Effects of 2,4-dichlorophenoxyacetic acid on the ripening of detached fruit.
Bot. Gaz., 1944, **106**: 199-207, bibl. 10.
At Beltsville, Md, the treatment of a number of detached

fruits with 2,4-dichlorophenoxyacetic acid (by spraying with or dipping in the aqueous solution which contained 0·5-2·0% Carbowax) was found to hasten the rate of starch hydrolysis, particularly in bananas, and colour formation and to bring about a more uniform rate of ripening, particularly in pears. As a result of treatment with the acid the ripening period was reduced with bananas to 3-8 days, with Yellow Newton apples to 2 weeks, with Grimes Golden apples treated 1 week before the usual picking date when still green to 6 days as against 2 weeks, with Kieffer pears picked 10 days before the usual time by 2-4 days, with Winter Bartlett pears to 8-10 days. The acid had no effect on the ripening of tomato, pepper and persimmon fruits.

871. Isaac, W. E. 664.85.11: 632.944
The effect of methyl bromide fumigation on apples.
Fmg S. Afr., 1944, **19**: 703-10, bibl. 8.
When during the war Kenya and Rhodesia, where the codling moth is absent, were recognized as possible supplementary markets for the South African apple industry, it became necessary to experiment with fumigation for the control of the pest in the fruits. A dosage of 2 lb. methyl bromide per 1,000 cu. ft. chamber space applied for 2 hours was found to kill eggs and larvae but at the same time to affect the fruit of certain varieties. It was the object of the present investigation carried out at the Government Low Temperature Research Laboratory, Capetown, to study the effect of methyl bromide on apples more closely. Fumigation proved injurious to the Red Delicious and Granny Smith varieties, particularly to large fruits, while it was safe to treat Ohenimuri, Pearmain, Rokewood and York Imperial. Typical external and internal methyl bromide injuries to Granny Smith apples are illustrated by photos, which make it clear that the absence of external injury is no guarantee of the absence of internal injury.

872. 664.85: 632.944: 632.693.2
(i) Southwick, F. W., Schuler, F. B., and Alpaugh, G. N.
Some trials with methyl bromide as a fumigant for rodents in cold storages.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 136-40, bibl. 6.

(ii) Kenworthy, A. L.
Injury to Williams apples resulting from fumigation with methyl bromide.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 141-5, bibl. 3.

(iii) Borg, R. M., and Southwick, L.
Methyl bromide as a fumigant for rats and mice in apple cold storages.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 146-50, bibl. 11.
(i) In trials in Connecticut it was found that exposure to methyl bromide vapour 0·5 lb. per 1,000 cubic feet for 4 hours sufficed to kill rats. Though it seems very unlikely that anyone would suffer from eating fruit so treated, complete details of its effect on apples are wanting.
(ii) Williams apples shipped from Delaware were badly damaged by methyl bromide fumigation used at the dosage recommended for Japanese beetle [amount not specified], suffering greatly from scald as the result of the higher fruit temperature at the time of fumigation. Starr and Wealthy apples and Golden Jubilee peaches were not injured by the same treatment.
(iii) Fumigation tests at Amherst, Mass., showed that treatment with methyl bromide at ½ lb. per 1,000 cubic feet for a 4-hour period or ¾ lb. for a 2-hour period was fatal to rodents in an apple store and did not cause any observable effect on the fruit.

873. Reyneke, J., and Pearse, H. L. 664.85.13.038 + 664.85.11.038
The relationship between respiration and physical condition of fruit as affected by oil treatments.
J. Pomol., 1945, **21**: 8-27, bibl. 7.
The quality of fruit is largely determined by the expressible juice content. At the Western Province Research Institute, Stellenbosch, S. Africa, a close relationship was found between rate of respiration, juice content, physical condition of the fruit and storage life in Bon Chrétien pears and Golden Delicious apples coated with thin films of various oils and wrapped and stored at room temperature. The oil reduced the rate of respiration and increased juice content in the pre-climacteric stage; applied after the pre-climacteric stage it maintained a low respiration rate and high level of juice. The oils used were, in order of efficiency: arachis, olive, butter, mineral, soya, maize. The unsaturated non-drying oils were more effective than the more saturated medium and drying oils. The reduced rate of respiration was accompanied by a reduced rate of acetaldehyde production, reduced acid consumption and a delayed onset of scald. Scald is here attributed to senescent breakdown with acetaldehyde formation as a secondary accentuating factor. Poor quality pears kept at high temperature, 86° F., under restricted ventilation and accumulated CO_2 showed reduced respiration, a small climacteric rise only, a high juice content, attractive colour and high palatability in contrast to pears kept at 58° F. Low concentrations of indoleacetic acid added to the oil increased respiration slightly; high concentrations reduced it. As a result of field treatments pears receiving oil sprays showed reduced respiration and less scald than trees sprayed with lead arsenate or not sprayed. Storage life of Bon Chrétien was much reduced and rate of respiration increased by the use of wetting agents with or without hydrochloric acid for the removal of arsenical residues. Maintenance of a low respiration rate and retention of good physical condition increased resistance of fruit to fungus infection.

874. Childs, J. F. L., and Siegler, E. A. 664.85.31: 632.952
Experimental control of orange decays with thiourea.
Phytopathology, 1944, **34**: 983-5.
Orange stem-end rots caused by *Diplodia natalensis* and *Phomopsis citri* and green mould, caused by *Penicillium digitatum*, were experimentally controlled by dipping the fruits in 5% thiourea. Previous to the treatment the oranges were exposed to ethylene vapours to afford maximum opportunity for decay.

875. Ramsay, G. B., Smith, M. A., and Heiberg, B. C. 664.85.3: 632.952
Fungistatic action of diphenyl on citrus fruit pathogens.
Bot. Gaz., 1944, **106**: 74-83, bibl. 4.
Diphenyl vapours were found to control the following diseases during transit, storage and marketing: Blue mould rot (*Penicillium italicum*), *Botrytis* rot (*B. cinerea*), *Diplodia* stem-end rot (*D. natalensis*), green mould rot (*Penicillium digitatum*) and *Phomopsis* stem-end rot (*P. citri*). So far, diphenyl-treated paper wraps have been used for the control of decay in commercial shipments. Another method of using this fungistatic agent was developed by the authors. Fibreboard boxes were fitted with 5 paper-pulp trays containing 20 cuplike depressions; the trays were impregnated with diphenyl. In one experiment two lots of 100 unwrapped oranges were placed in two boxes, the trays of one of which were treated with diphenyl. After 3 weeks' storage at 72° F. and 40% relative humidity the fruit in the control box had 25% decay as against 1% in the impregnated trays. Diphenyl vapours proved incapable of controlling *Alternaria* rot (*A. citri*), anthracnose (*Colletotrichum gloeosporioides*), brown rot (*Phytophthora citrophthora*), cottony rot (*Sclerotinia sclerotiorum*) and *Trichoderma* rot (*T. viride*).

876. NYLUND, R. E. 664.84.13
A study on the storage of carrots under home conditions.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 405-12.
The effect of storing carrots at 36° F., 42° F. and 52° F. in damp sand or soil, unlined baskets, covered crocks, tin cans, etc., with and without prior removal of crowns. The lowest of the three temperatures was the best.

877. STAHL, A. L., AND VAUGHAN, P. J. 664.85.038+664.84.038
Pliofilm in the preservation of Florida fruits and vegetables.
Bull. Fla agric. Exp. Stat. **369**, 1942, pp. 92, bibl. 26.
The physical properties of pliofilm, a synthetic plastic containing rubber hydrochloride as its principal base, are discussed. The material, which is waterproof and therefore reduces moisture loss but at the same time allows respiratory gases to escape, was found to preserve the original quality of fresh Florida fruits and vegetables for a long time when used as a wrapper on their way to distant markets. The optimum storage temperature for round oranges and mangos proved to be 37° F., while 42° F. was most suitable for mandarin oranges, grapefruit, limes, persimmon, peaches (marketable 4-5 weeks) and avocados. With 13 vegetables, a combination of the pliofilm wrapper with refrigeration gave the best results. The data on the effect of the wrapper upon the marketable life, etc., of the fruits and vegetables tested are presented in full.

FOOD VALUES AND PROCESSING.

878. MURNEEK, A. E. 577.16: 613.2
Vitamins in our food.
Science, 1944, **100**: 557-62, bibl. 12.
A review of the part played by vitamins in present-day society was read before the Agriculture and Botany Sections of the American Association for the Advancement of Science by the retiring vice-president, under the following headings. Demonstration and distribution of vitamins; Vitamins in human nutrition; Vitamin content of foods; Vitamin pills; The instinct for good food. At present America is in the throes of a vitamin craze, and the popularity of vitamin pills has reached an epidemic stage helped on largely by advertising campaigns. The speaker considers that when the average man and the emotional nutritionists return to sanity, the human instinct for a healthy diet will secure means to control the present undesirable food situation and that man will be nourished more properly, to the benefit of his gastro-intestinal flora, his health and serenity.

879. SISAKJAN, N. M. 664.84.047: 577.16
The preservation of vitamins in potatoes and other vegetables during drying. [Russian.]
Biohimija, 1943, **8**: 254-68.
It is concluded that the content of vitamin C, the appearance, and the flavour of potatoes, cabbage, onions and tomatoes are better preserved when these vegetables are previously subjected to the fumes of burning sulphur either in the sun or in an oven. It was proved, moreover, that cooking destroyed less of the vitamin C. One of the methods recommended for potatoes is to boil the tubers until the skin can be easily removed, then cut them prism-wise and sulphur them for 40 minutes before drying at 85° to 90° C. This enabled 98% of the vitamin C to be preserved. Cabbages should not be sulphured for longer than 30 minutes before being dried. About 50% of vitamin C could thus be preserved. Though onion contains comparatively little vitamin C, it has, nevertheless, for reasons still not understood, a strong antiscorbutic action. After being sulphured for 40 minutes and then dried in the sun, it retained 73% of its vitamin C. Tomatoes were cut in halves, sulphured for 20 to 30 minutes, and dried in the sun for 2 days, retaining 72% of their vitamin C. Though oven-drying destroyed less of the vitamin C than did sun-drying, the product was in other respects of better quality. The traces of SO_2 detected in the final products were negligible, and cooking diminished their amount still more. The dry sulphuring method is preferred to the wet

880. PLATENIUS, H. 635.1/7: 581.192: 577.16
Diurnal and seasonal changes in the ascorbic acid content of some vegetables.
Plant Physiol., 1945, **20**: 98-105, bibl. 8, being *Pap. Dep. Veget. Crops Cornell Univ.* **264.**
There were no consistent differences in the ascorbic acid content between morning and evening samples of snap beans, sprouting broccoli, cauliflower, kale, spinach and Swiss chard when calculated as percentages of dry weight. Also seasonal fluctuations proved to be slight, as shown by a not more than 20% decline of vitamin C concentration in kale leaves during the period 29 July to 26 October. Apparently, the effect of reduced light intensity is compensated by a drop in temperature.

881. MCCONNELL, J. E. W., ESSELEN, W. B., Jr., AND GUGGENBERG, N. 664.84: 577.16
Effect of storage conditions and type of container on stability of carotene in canned vegetables.
Fruit Prod. J., 1945, **24**: 133-5, bibl. 15, being *Contr. Mass. agric. Exp. Stat.* **549.**
No carotene losses were found to occur in asparagus, green beans, maize and peas either during the canning process or during storage. Neither type of container nor exposure to light affected the carotene content of the product.

882. BALAHOVSKIĬ, S. D., AND BULGAKOV, N. I. 664.84.047: 577.16
The determination of ascorbic acid in sulphured and fresh products. [Russian.]
Biohimija, 1943, **8**: 275-82.
In order to overcome certain difficulties associated with the determination of ascorbic acid in vegetables which have been sulphured before being dried, the method here described was devised. It involves the use of H_2S without a Kipp's apparatus; and can be employed for leaves and other vegetable substances containing dehydro-ascorbic acid.

883. PEPKOWITZ, L. P., AND OTHERS. 635.1/7: 577.16
The carotene and ascorbic acid concentration of vegetable varieties.
Plant Physiol., 1944, **19**: 615-26, bibl. 21.
The carotene and ascorbic acid concentration was determined at Rhode Island Experiment Station for beet, pepper, pea and carrot varieties. Ascorbic acid content increased with the degree of maturation in all cases except beet. Overmature peas showed a 39% decrease compared with best marketable stage. Peas also showed increasing ascorbic acid content with wider spacing, but above 1 inch spacings yield was greatly reduced and the increase in ascorbic acid of no economic importance. In carrots carotene increased during growth until 90 days from seeding and then decreased. Large type strains had less carotene than small type. Varietal differences in ascorbic acid concentration were found in beets, peppers and peas and in the carotene concentration of carrots. Beets, peppers and peas showed no significant intervarietal differences in carotene concentration.

884. GIK, Y. 577.16
Production of vitamin C in the U.S.S.R.
Science, 1944, Vol. **100**, No. 2596, Supplement, pp. 10.
Vitamin C in Russia is largely obtained from unripe walnuts from the Zakatalsk forests, where the nut trees are plentifully

distributed over an area of 10,000 acres. The vitamin is extracted by washing the nut, in which an incision has been made, in several changes of water. Temperature has to be strictly controlled [degrees not stated.—ED.] and the raw material has to be kept in hermetically sealed vessels. The juice at first proved unbearably bitter and a process was devised to render it more palatable. The vitamin C content is at its highest in spring and early summer when it forms from 1·5% to 3% of the weight of the entire nut. The vitamin C content of oranges, lemons and tangerines is only between one-fortieth and one-fiftieth that of the Zakatalsk nuts. A factory has now been established in the forest for processing these nuts.

885. HOHL, L. A., AND SMITH, M. 664.84.037: 577.16
Comparison of vitamin content and palatability of frozen, canned and dehydrated vegetable purees.
Fruit Prod. J., 1944, **24**: 54-6, 62, bibl. 22.
The results of this study, which compares the effect of different processing methods and of storage on asparagus tips and butts, carrots, peas, peas + pods and spinach, show that vitamins B_1, B_2 and C as well as palatability and appearance are best preserved by freezing. Canning ranked next followed by dehydrated powders packed in vacuum. Tabulated data indicate the initial vitamin content of the fresh vegetables, the vitamin content after processing and after different periods of storage. The figures for vitamin C content of asparagus tips directly after processing and after 6 months' storage, for instance, are (mg./100 g. on dry basis): canned: 329 and 364; dehydrated: 454 and 87; frozen: 406 and 432 respectively.

886. KELLY, E., AND CHRISTENSEN, F. W. 635.11: 577.16
Ascorbic and dehydroascorbic acid in cooked garden beets.
Science, 1944, **100**: 248.
At North Dakota Experiment Station garden beets Detroit Blood Red stored from October 1943 to July 1944 in a vegetable storage cabinet and beets of the same variety pulled fresh and slightly less mature gave the following mg. per 100 g. when tested on a fresh basis for reduced ascorbic acid and dehydroascorbic acid. Fresh beets; reduced 17·48, dehydro. 8·41, total 25·89. Stored beets, 9 months, reduced 12·61, dehydro. 13·14, total 25·75. Thus a considerable change during storage of ascorbic acid to the dehydro-ascorbic form without any appreciable destruction is indicated, and it follows that the full vitamin C value is not shown by determining only the reduced ascorbic acid.

887. WEIER, T. E. 635.13: 577.16
Carotene degradation in dehydrated carrots. II. Stability of carotene in carrot tissue kept in moist air at 60° C.
Amer. J. Bot., 1944, **31**: 537-44, bibl. 20.
The stability of carotene in carrots subjected to moist air at 60° C. for twenty-one hours was studied. Blanching affords considerable but varying amounts of protection. The amount of degradation of the carotene increased greatly when the carrots were leached after heating. When the carrots are killed the carotene rapidly goes into solution in an intracellular oil. As the carotene disappears from this oil, substances are formed that regenerate Schiff's reagent. This fact suggests that deterioration in dried carrots may be due to the autoxidation of fats, with concomitant breakdown of the carotene. The increase in the stability of the carotene after blanching, and the subsequent decrease in stability after leaching, indicate that the presence of an inhibitor rather than the inactivation of an enzyme causes the increased stability of the carotene in blanched carrots. [From author's summary.]

888. POOLE, C. F., AND OTHERS. 635.34: 577.16
Differences in stability of thiamin, riboflavin and ascorbic acid in cabbage varieties.
Proc. Amer. Soc. hort. Sci. for 1944, 1944, **45**: 396-404.
According to variety, season, cooking and dehydrating.

889. LE RICHE, F. J. H. 635.64: 577.16
Ascorbic acid content of tomato varieties.
Fmg S. Afr., 1945, **20**: 105-10, bibl. 7.
On the experimental farm Varkensvlei on the Cape Flats 35 tomato varieties were grown on two random plots by the Western Province Fruit Research Institute, Stellenbosch. Ascorbic acid content and soluble solids, between which a positive correlation appears to exist, were found to vary according to variety. Even differences in the vitamin C content of the same tomato varieties grown by different nurserymen proved considerable, 26·16 and 15·41 mg. p. 100 g. in the case of Marglobe for instance. A comparison of preserving methods showed that vitamin C retention in canned tomatoes (11·73 mg. p. 100 g. on the average) was higher than in the dehydrated product and that the best method of dehydration consists in pulping the fruit, followed by heat-inactivation of the enzyme system and spray drying.

890. TUBA, J., CANTOR, M. M., AND HUNTER, G. 635.937.34: 577.16
Bio-assay vitamin C in rose hips.
Canad. J. Res., 1945, **23**, Sec. E, pp. 1-4, bibl. 5.
Bio-assay evidence is presented to show that the reduction of 2,6-dichlorophenolindophenol in native Alberta rose hips is due to ascorbic acid. The values given for the ascorbic acid in rose hips by this method are substantially correct.

891. TUBA, J., HUNTER, G., AND KASTELIC, J. 635.937.34: 577.16
Approximate nutrient composition of dried rose hips.
Canad. J. Res., 1945, **23**, Sec. E, pp. 5-7, bibl. 11.
The dried fleshy part of Alberta wild rose hips are rich in vitamins C and A and contain appreciable amounts of thiamin, riboflavin and niacin. The material also contains 30% fermentable sugar as glucose and fructose and a further 10% is set free by hydrolysis. Protein is 5·5% and lipids 1·5%.

892. LAL, G. 663.813: 634.3: 577.16
Studies in the preservation of fruit juices. IV. Vitamin C (ascorbic acid) content of citrus fruit squashes.
Ind. J. agric. Sci., 1944, **14**: 171-80, bibl. 16.
The following were the chief results obtained at Lyallpur in a study of ascorbic acid preservation in orange (Malta) and lemon (Eureka) squashes during storage: (1) Sodium benzoate and pasteurization proved inferior to the addition of sulphur dioxide in respect of vitamin C conservation. (2) With orange juice, preheating (87·5° C. for 2 min.) had a protective influence on the ascorbic acid content, possibly owing to the inactivation of some ascorbic acid oxidase present, while lemon juice was adversely affected by the same treatment. (3) The optimum sugar concentration for juice to be stored for one year was 45° Brix. (4) During a storage period of one year orange squash was found to be liable to heavier vitamin C losses than lemon squash.

893. SINCLAIR, W. B., BARTHOLOMEW, E. T., AND RAMSEY, R. C. 663.813: 634.31: 581.192
Analysis of the organic acids of orange juice.
Plant Physiol., 1945, **20**: 3-18, bibl. 11, being *Pap. Calif. Citrus Exp. Stat.* **518.**
The total free acids in the juice of mature Valencia and navel oranges were calculated [according to specified methods]. The concentration of malic acid in different juice samples varied only slightly, as compared with the changes in the citric acid content. With one exception, the samples

studied had a malic acid content of from 1·40 to 1·77 mg. per milliliter of juice, while the citric acid varied from 8·38 to 25·39 mg. per milliliter. It is evident that variations in acidity of the orange are due chiefly to changes in the citric acid concentration. Apparently, there is a definite relation between the free acid—combined acid balance and the pH of the juice. The amount of combined acids in the juice is remarkably uniform; this indicates that the free-acid concentration is the chief variable. With a decrease in the value of total free acid: total free and combined acids, a corresponding rise in pH occurs. [From authors' summary.]

894. Bureau of Agricultural and Industrial Chemistry (Moore, E. L., and others). 663.813: 634.3

A second year of citrus research on byproducts and problems of the citrus canning and concentrating industry in Florida.

Fruit Prod. J., 1944: **24**: 71-3, bibl. 5, reprinted *Calif. Citrogr.*, 1945, **30**: 70.

Concentrates and powdered juices. Bacteriological, colour and flavour examinations are being made regularly on orange juice concentrates kept at various storage temperatures. Comparisons are being made of concentrates made at commonly used commercial temperatures and pressures with those made at lower temperatures and pressures. A patent has been applied for a method of diluting orange concentrates with fresh orange juice before canning in order to protect this process for public use. A double-drum dryer with facilities for producing a high vacuum is being studied with reference to its suitability for drying citrus juices. *Glass- and tin-packed products.* High vitamin C retention (98-99%) was observed in unsweetened orange juice and grapefruit packed in glass and tin containers and stored at 80° F. and 40° F. for 6 months. Colour was well retained except by bottled grapefruit juice at 80° F. Flavour was well retained at 40° F., but at 80° F. the bottled juices became unpalatable and the canned juice somewhat off-flavoured, though still reasonably satisfactory. Glass-packed juices should be kept at 40° F. When so treated they were in perfect condition after a year, as were the canned juices so stored. Commercially packed, unsweetened grapefruit juices from 12 canning plants were examined during all stages of processing. Six months after storage at room temperature (80° F.) 83% of the vitamin C was still retained. *Citrus by-products.* The surplus tangerine crop can now be profitably treated to produce a concentrated beverage base or a bland table syrup of high food value. By the use of a tapered screw press one-third of the oil present in the surplus Persian limes was recovered and can be recovered as cold-pressed lime oil, the highest priced volatile citrus oil. A high grade dried citrus pectin can now be made from grapefruit cannery peel residue, most of which was formerly thrown out. The peel and pulp of grapefruit after juice extraction form a good source of vitamin C. Experiments are in progress on the extraction and concentration of water-soluble constituents of the peel and their inclusion in beverage bases as a source of fruit flavour, natural vitamin and pectin.

895. Esselen, W. B., Jr. 663.813: 634.11

A study of methods of clarification and blends of Massachusetts apples for apple juice.

Fruit Prod. J., 1945, **24**: 165-8, 189, bibl. 13, being *Contr. Mass. agric. Exp. Stat.* **557.**

A comparative study of the effect of clarification methods on sediment formation and flavour in apple juice showed that flash-heating was superior to all other treatments tested. The flavour of the finished product was found to be influenced both by the temperature at which the apples are ground and pressed and the speed with which the juice is pasteurized. Fresh apple flavour is retained as a result of handling the fruit at a cool temperature followed rapidly by flash-heating, while higher temperatures and a time lag before pasteurization will produce a typical cider flavour and colour. In view of the insipidity of McIntosh juice the produce had to be blended with Baldwin and Delicious juice, the maximum percentage recommended of McIntosh and Delicious being 60 and 25 respectively.

896. Milleville, H. P., and Eskew, R. K. 663.813: 634.11

Recovery and utilization of natural apple flavors.

Circ. AIC-63 (undated), from reprint *Fruit Prod. J.*, 1944, **24**: 48-51.

The authors succeeded in recovering the volatile constituents of natural apple flavour which are completely lost in the preparation of bland apple juice and commercial apple concentrates. The process, which is described in detail, consists of superheating the juice, flash vapourizing it at atmospheric pressure, mechanically separating the vapours from the unvapourized juice and fractionating the vapours to obtain a more concentrated flavour. The product is a colourless water solution of the volatile constituents concentrated 100-150-fold. It is believed that the principles of this process are also applicable to the recovery of natural flavours from other fruits.

897. Engstedt, G. 663.813

Musten och mikroorganismerna. **(Fruit juice and micro-organisms.)**

Sverig. pomol. Fören. Årsskr., 1944, **45**: 72-6.

In this paper, read at the meeting of the Swedish Pomological Association at Kristianstad, 1944, the control of yeasts, moulds and bacteria in fruit juices by various chemicals is described.

898. Cruess, W. V. 663: 813: 664.85.037

A note on frozen pack fruit syrups and concentrates.

Fruit Prod. J., 1944, **24**: 36, 61.

Fruit syrups made by adding sugar to the fresh juices and fruit concentrates made by freezing concentration or vacuum concentration were found to remain practically unaltered for an indefinite period if stored at approximately 0° F.

899. Cox, R. E. 664.85.037

Something new in frozen foods.

Fruit Prod. J., 1945, **24**: 169, 187.

A frozen fruit product which will form the basis for readily made household jelly and jam has been evolved at the Research Department of the California Fruit Growers' Exchange, Corona, by adding pectin and acid to fruit pulp or juice before freezing. Methods of preparation and of thawing and heating the frozen product are specified.

900. Leslie, L., and Tressler, D. K. 664.85.11.047

Varietal suitability of popular New England apples for home dehydration.

Fruit Prod. J., 1944, **24**: 68-9, 91.

The drying of apples in a dehydration cabinet for home use is described. The product when used in pies, etc., is claimed to be superior to home-canned apples or apples stored in the home for several months. A period of storage did not affect the quality of the powder. Of 8 popular Massachusetts and New Hampshire varieties tested, McIntosh was found to be most suitable for the purpose.

901. Friar, H., and van Holten, P. 664.85.774.047

Pineapple dehydration.

Fruit Prod. J., 1944, **24**: 70, 89.

In experiments conducted at the University of California ripe Hawaiian pineapple was found to make a good dehydrated product when sulphured and not blanched. It is, however, suggested that soaking the fruit in a hot glucose and cane sugar syrup at 40° Brix, prior to dehydration, and consuming the product as a confection is possibly the most desirable treatment and use. The results obtained are summarized in tables.

902. CRUESS, W. V., AND OTHERS. 664.85.047
A new method of sulfuring fruit for drying.
Fruit Prod. J., 1944, **24**: 103, 121.
An account of research conducted in co-operation with the Office of Research and Development of the U.S. Army, Quartermaster Corps. The tabulated data show that by resulphuring apricots during the drying process, when the fruit is about half-dry, the product attains a sufficiently high SO_2 content (14,000 p.p.m.) to withstand storage under tropical conditions in sealed containers. Loss of SO_2 during drying was found to be much greater in sun dryng than in dehydration. A remedy for the loss of juice from blemished apricots and peaches during sulphuring is suggested.

903. SINGH, L., GIRDHARI, L., AND JAIN, N. L. 664.85.047
Reprocessing of dried fruits.
Ind. Fmg, 1944, **5**: 416-9.
Methods were developed at the Fruit Products Laboratories, Lyallpur, for reprocessing such dried fruits as apricots, figs and raisins of inferior quality which are imported in large quantities from Afghanistan. The following recommendations are made: (1) Wash the fruits thoroughly but gently in cold water for about 5 minutes. (2) Drain off the water and spread the fruit on wooden flat bottom trays. (3) Sulphur the fruit immediately according to specified dosages and times. (4) Dehydrate at 150-155° F. (5) Pack dehydrated fruit in fairly airtight and moisture-proof containers after discarding raisin stems and damaged fruits.

904. TOMKINS, R. G., AND OTHERS. 664.84.047
The drying of vegetables III. The storage of dried vegetables.
J. Soc. chem. Ind. Lond., 1944, **63**: 225-31, bibl. 19.
The work described is being carried out at the Low Temperature Research Station, Cambridge. The storage life of a dried vegetable is the period during which its ascorbic acid content equals or exceeds that of the freshly dried sample, or, when reconstituted, its flavour, colour and general edibility is rated as "fair" by a tasting panel. Samples with low moisture content store better than those with high. Storage at temperatures above 30° C. results in rapid deterioration, whereas storage at low temperatures is definitely beneficial in retarding deterioration in culinary quality and loss of ascorbic acid. Storage in nitrogen and carbon dioxide retards loss of ascorbic acid and carotene and is essential for the preservation of a good standard of culinary quality of dried carrot though not of dried cabbage or potato.

905. PENTZER, D. J. 664.84.5.047
Dehydration of Texas-grown snap beans.
Fruit Prod. J., 1945, **24**: 136-7, 157, bibl. 7, being *Contr. agric. chem. Res. Div.* **156.**
In a comparative test of 15 bean varieties at Weslaco, Texas, Decatur and Blue Lake Stringless received highest and second highest marks respectively for quality after dehydration, while the Refugee variety, which is most extensively grown for canning, ranked lowest. The best pre-treatment before dehydration was to blanch for 10 minutes in flowing steam and dip the blanched beans in a solution of sodium bicarbonate, which made them tender. The β-carotene retention, which was found to be related to colour retention, ranged from 53·7 p.p.m. to 20·1 p.p.m. dry basis, according to variety.

906. TRESSLER, C. J., Jr. 664.84.21.047
The use of sulfite solutions in potato dehydration.
Fruit Prod. J., 1944, **24**: 104-5, bibl. 5.
The advantages to be gained by the use of sulphite solutions in potato dehydration far outweigh the disadvantages. A means of control of darkening of surfaces of whole potatoes is afforded by dipping the freshly peeled tubers in 1 to 2% sulphite solution, and even more ideal control is to be had, if this is followed by a second dip at the time of trimming. Further control of darkening, assurance against scorching, increased storage life and higher ascorbic acid retention are brought about by sulphiting the diced product. [From author's summary.]

907. BAILEY, G. F., AND DUTTON, H. J. 664.84.13.047
Apparent increase in carotene of carrots during process of dehydration.
Fruit Prod. J., 1945, **24**: 138, 142, 155, bibl. 5.
It was shown at the Western Regional Research Laboratory, Albany, Calif., that the observed increase in carotene of carrots during dehydration (up to 31·9%) is not due to faulty methods of determination but to a loss of soluble solids.

908. HEID, J. L., AND CURL, A. L. 634.651-1.57
Papaya products.
Fruit Prod. J., 1944, **24**: 41-4, 53, bibl. 21, being *Contr. agric. chem. Res. Div.* **154.**
A description is given of experimental methods worked out at the U.S. Citrus Products Station, Winterhaven, Fla, for preparing attractive products of papaya (*Carica papaya*) by dehydration, canning, pickling and preserving. The fruit of selected varieties has a delicious flavour and is an excellent source of vitamins A and C, the vitamin C content of fresh and dehydrated pulp on a dry basis being 461 and 234 mg./100 g. respectively. Owing to its high sugar content combined with the candy-like taste and texture dehydrated papaya is believed to be suitable for incorporation in concentrated food as well as in confectionery.

909. DA SILVEIRA, A. H. 634.74
Pequena indústria da jaboticaba. (**Utilization of the fruit of *Myrciaria* spp., the jaboticabeira of Brazil.**
Ceres, 1943, **5**: 136-40.
The name jaboticabeira is applied to various species of *Myrciaria* (*M. cauliflora, M. jacoticaba* and others), natives of Brazil. The trees bear glossy, maroon-purple fruit in great abundance. The pulp has an agreeable vinous flavour suggestive of the grape. This paper is concerned solely with recipes for processing this fruit in various ways, jelly, syrup, wine, vinegar and liqueurs, etc. [An account of this tree will be found in *J. Hered.*, 1914, Vol. 5, No. 7.]

910. OGARIN, A. I. 633.72-1.542
Obtaining a concentrated tea extract from tea-bush prunings. [Russian.]
Biohimija, 1944, **9**: 90-100.
On account of their coarse and fibrous nature the spring prunings of the tea bush cannot be subjected to the normal process of fermentation, and hence the extract obtained from them cannot be made into drinkable tea. The action of the oxidizing enzymes in the extract of such prunings is hardly perceptible, so the author has devised artificial methods of bringing about the desired result, either by testing the liquid extract for 16 hours at 80° to 85° C., or by the use of manganese as a catalyst. The latter method completes the oxidation and other changes in 7 hours. The resulting liquid is next filtered and evaporated. In flavour and composition it compares favourably with ordinary, and in some respects good, tea.

911. ANON. 664.84.047: 631.16
(2) **Cost accounting for vegetable dehydration plants.**
Fruit Prod. J., 1944, **24**: 74-8.
WESTERN REGIONAL RESEARCH LABORATORY, ALBANY, CA. 664.84.21.047
Information sheet on the application of drying-rate nomographs to the estimation of tunnel-dehydrator drying capacity. I. Riced white potatoes.
Fruit Prod. J., 1944, **24**: 108-13.

NOTES ON BOOKS AND REPORTS.

912. BAKER, J. O. 635.1/7 + 631.544
Market gardening.
Vawser & Wiles, London, 1944, pp. 64, 2s.
This does not deal at all with the cultivation of market garden crops and might perhaps more appositely be entitled "The would-be market gardener's guide", since anyone who is thinking of taking up market gardening might well consult it with profit in preparation for his venture. While still free to choose he will get an insight into some of the problems of the business. Thus he will learn of the different types of market gardening, of capital required, of the aid obtainable from the Land Settlement Association, of buying *versus* renting land, of institutes which can train him and of sources of information, literary and others, which may prove useful to him. Finally in appendix D he will find much useful tabulated information on weights and measures as touching horticultural crops and their layout, and on seed germination and yields in the chief market garden crops. Clear illustrations are given of several horticultural cultivators.

913. DAHL, C. G. 634.11 + 634.13 + 634.22
Pomologi. Beskrivningar över de viktigaste i Sverige odlade fruktsorterna. Del I. Äpplen. Del II. Päron och plommon.* **(Pomology. Descriptions of the more important tree fruit varieties grown in Sweden. Part I. Apples. Part II. Pears and plums.)** Second revised and enlarged edition. Albert Bonniers Förlag, Stockholm, 1943, pp. 300 and 390, 67 coloured plates, Kr. 83.—(cloth), 98.—(quarter leather).
The stated aim of these superbly illustrated and produced books is the introduction of better quality fruit to horticulturists in Sweden. In all, 128 apple, 80 pear and 54 plum varieties are described, most of them being depicted in lifelike reproductions of very accurate watercolour drawings as well as in numerous line drawings in the text.
Although primarily intended for Swedish readers, these volumes should be of great interest to pomologists and fruitgrowers everywhere, for amongst the varieties described are many international varieties including most of the leading English ones. These varieties are considered by Dahl to be worthy of wider cultivation in Sweden instead of many of the local sorts and, as an aid to intending planters, two maps of Sweden are given, dividing the country into six zones, reference being made in the text to the particular zones suitable for each variety so far as is known at present. Winter frost hardiness appears to be the major factor limiting the range of the fruits grown in Sweden and is given special mention.
The descriptions of each variety of apple follows a definite plan with paragraphs on (1) Literature and synonomy, (2) History of the origin of the variety and its introduction into Sweden, (3) Tree characters: habit of growth and description of shoots, leaves and flowers, including notes on quality of pollen and fertility of flowers, (4) Fruit characters: size and shape, calyx, stalk, skin, aroma, core shape, calyx tube, flesh and ascorbic acid content where it is known, (5) Season and use, with, wherever possible, reference to the behaviour of the variety in England, and (6) Culture. The last paragraph is especially interesting to the would-be planter, as besides telling where the variety should be grown notes are given on pruning, spraying, including spray damage susceptibility, and rootstock preferences. It is, however, surprising to read that one of the forms recommended for Bramley is a "dwarf tree" on "E.M. II".
The descriptions of pears and plums follow a similar general plan. The whole section on plums is additional to the matter in the first edition. In describing the plum fruits further characters are used, the stones especially being depicted and described, the sculpturing on their surface being an important aid to identification. The suture and stigma scar on the fruit are also described.
No pomologist should allow a lack of Swedish to deter him from getting these two books by hook or by crook. He will not, we think, regret his action. H.B.S.M.

* A brief note of this work has already appeared; *H.A.*, 1944, 14: 2: 471.

914. FELT, E. P. 631.543.82
Shelter trees in war and peace.
Orange Judd Publishing Co., N. York, 1943, pp. 320, $2.50.
The first chapters prepare the ground by establishing the value of the shelter or shade tree as an amenity in peace and a protective concealment in war. As a producer of raw material it is not here considered. The point is made that, while the value of trees is universally admitted, their treatment and care is neglected or not understood and that many trees have been killed by misdirected efforts to save them. Chapters follow on how a tree grows and some elementary physiology is included. A list of the many troubles which may overtake a tree, most of them caused by human intervention, is given, each with a reference to a subsequent paragraph in which cause and prevention or cure are discussed. A large and possibly the most useful part of the book is made of selections of trees suitable for various unfavourable conditions, such as smoky atmosphere and seasides and for the various climatic regions of the United States. These lists are provided by the competent local authorities and are presumably based on experience. They have been ably supplemented by the author in a chapter entitled Shelter or shade trees of the United States, in which copious notes are given on the habit and requirements of a very large number of species and varieties. This is a most interesting chapter and will be valuable to those who are considering the introduction of varieties new to a locality. The author's insistence of the planting of trees for camouflage from aerial attack seems even now a little out of date and will be still more so after the 30 years which will have passed before such protection could become effective. By then, surely, if present progress is maintained, the technique for the wholesale extermination of mankind will have been so perfected that a few trees more or less will be immaterial.

915. GARRETT, S. D. 632.4: 581.144.2
Root disease fungi.
The Chronica Botanica Co., Waltham, Mass. (Wm. Dawson & Sons Ltd., London), 1944, pp. 177, bibl. approx. 480, $4.50.
This first volume of the "Annales Cryptogamici et Phytopathologici" is, as stated in the preface, not a text-book of the individual root disease fungi but views these fungi as an ecological group, united by the common factor of soil habitat. Following an introductory chapter, mainly historical in character, the first part of the book (Chaps. 2-8) deals with the behaviour of root-infecting fungi and the influence of soil conditions thereon. After a brief discussion of parasitic specialization in soil fungi and a note on mycorrhiza, the modes of spread underground of the specialized soil parasites are described. The effect of soil conditions on parasitic activity is discussed at some length under six headings—temperature, moisture content, texture, reaction, organic content and concentration of plant nutrients. Chapters 7 and 8 are devoted to descriptions of the saprophytic activity and dormancy of the root infecting fungi. The second part of the book (Chaps. 9-15) deals with the control of root diseases. For field crops, rotation, plant sanitation and treatments available under growing crops are all described at length. Disease control in plantation crops, unfortunately limited here to tropical problems, is discussed in two chapters dealing with virgin areas before planting and with established plantations. A number of root diseases which require special treatment are then described and the final chapter deals with control under glasshouse

conditions. The arguments and discussions throughout the book are very fully documented but in places somewhat difficult to follow on account of the number of supporting facts and references embodied in the text. It is unfortunate that it was not possible, doubtless owing to wartime restrictions, to include more illustrations. There is an exhaustive bibliography and an excellent index and the work provides a most useful source of information for research and advisory plant pathologists and horticulturists concerned with soil-borne diseases. W.G.K.

916. HEDRICK, U. P. 634.1/7
Fruits for the home garden.
Oxford University Press, London, New York and Toronto, 1944, pp. 171, $3 or 16s. 6d.

Written by Dr. Hedrick in his retirement, this most readable book contains most of the information necessary to enable the North American amateur with a small orchard, or a few trees and bushes, to make his horticulture a success. The first seven chapters instruct in the arts of propagation, planting, pruning, pest control and other matters of cultural importance. Of the remainder, seven are each devoted to a particular tree fruit and two to bush and bramble fruits. Strawberries have a chapter to themselves. For English readers the chief interest lies in the general discussion of gardening problems in which the book abounds. The author's dicta on what constitutes a good apple stand for any land and are almost worth learning by heart. For the ordinary commercial apple he has little use, to him eating them is just eating. The kind of apple to have (if you can get it) is that " from the home garden of an epicure adventuring in the realms of the best that grows ", and then it has to be eaten exactly at the fleeting moment of ripeness, or the volatile ethers that control flavour and aroma will have fled. The names of 26 apples of epicurean qualities are given but they are not for us, for when translated to another hemisphere they leave their better qualities behind. Emphasis on the importance of fruit quality pervades the book, and proper times for picking and methods of picking and of storing, on which quality so much depends, receive close consideration for each kind.

917. KING, F. C. 631.875
Gardening with compost.
Faber & Faber, London, 1944, pp. 116, 4s. 6d.

Mr. F. C. King, who controls the Levens Hall gardens in Westmorland, has, to use an elegant modern term, been " plugging " compost for years by pen, speech, and example. He cannot be accused of preaching what he does not practise. As a result, in the words of Sir Albert Howard, who, not unnaturally, has contributed an enthusiastic introduction and a vigorous final chapter, " garden after garden is giving up artificials and poison sprays and beginning to produce real food instead of artificial nourishment ". Mr. King is an uncompromising compost advocate and uncompromising advocacy in any direction is apt to engender opposition in the compromising English breast. Is there not something to be said for the other side, the reader may wonder. If there is, he will not find it here. The chapter on artificial fertilizers, for instance, is headed " Some bad effects of artificial fertilizers ". However that may be, the book is easy to read. The author presents his views and discusses his results in a terse and forceful manner that holds the attention, and the practical advice on the construction and use of the compost heap tells all that is necessary in commendably few words. Lack of space prohibits here a full setting out of Mr. King's creed, but his assertion that the person who burns his waste material is of far less value to the garden than the slug that eats it is a new and pleasing thought that should not go unrecorded. Weeds, too, it is claimed, do more good than harm especially on unoccupied ground, for the presence of plant life is essential to soil fertility. Weeds such as coltsfoot and sow thistle are excellent subsoilers. Thistles may be allowed among a crop provided they are pulled 3 or 4 times a year. Annual weeds rarely harm any but seedling crops, in fact often Mr. King deliberately sows weeds such as groundsel for reasons which, as inscribed by his persuasive pen, seem to be quite sound. At Levens Hall onions and weeds are grown purposely together. It is found that the soundest and longest-keeping crop from onions planted out in April is that obtained from plots in which weeds are allowed to develop after the first week in July, for they compete with the onions for the soil nitrogen and assist greatly in the ripening process. The onion may be completely covered with weed without harm. The chapter on weeds may comfort the conscience of the lazy gardener; that on compost and its preparation will convince him that the energy he saves on the weeds will be more than expended on the management of the compost heap. The author and Sir Albert determinedly assure him that his efforts will be well worth while. The case for compost is ably argued, many of the views expressed are undoubtedly sound and, if the reader is not wholly convinced, let him get the best of both worlds and combine artificials with his compost. He will not be far wrong.

918. LEVITT, J. 632.111
Frost killing and hardiness of plants. A critical review.
Burgess Publishing Co., 426 South 6th Street, Minneapolis, pp. 221, mimeographed, $3.

A review containing some 626 references is presented of the literature on frost killing and cold hardiness of plants. The plan followed is to abstract the views of each worker without comment and in the digest at the end of each section for the reviewer to give his own views, with the object of arriving at some logical conclusion through a critical examination of the recorded results. Dearth of decisive evidence is prevalent and few of the conclusions, it is admitted, can be fully proved. At the end the author propounds a theory of his own which, while it can only be regarded as tentative, is unique, he claims, among those so far put forward, in agreeing with all the known facts.

919. ROWE, W. H. 635.976+635.977
Trees and shrubs.
Penguin Books, Harmondsworth, Middlesex, S145, 1944, pp. 192, figs. 36, plates 15, 9d.

Addressed to the amateur or " general reader " this handbook explains briefly and simply what to plant in various situations, how to do it and how to nurture the many plants listed. Methods of propagation, purchase, planting and pruning are described. Selected lists are given of climbers and wall-plants, hedge plants, shrubs and trees, both evergreen and deciduous. Roses have a small chapter to themselves. The reader is referred to a more detailed work on pruning. A guide to sources of information on other subjects, necessarily handled in brief here, would have proved useful. The fifteen photographs of beautiful trees add to the value of this readable little book. R.J.G.

920. SEABROOK, W. P. 634.1/7
Modern fruitgrowing.
Sixth edition, Ernest Benn, London, 1944, pp. 307, 10s.

The first edition of this book, which appeared in 1918, served as the main textbook of commercial fruitgrowing for about ten years without any revision. Since 1929, new editions with revision were issued every three or four years until the beginning of the war. The present edition, the sixth, attempts to bring the information right up to date, the chief addition being an excellent chapter on dwarf pyramids, in place of one on cordons, the latter method being relegated to a small part of the new chapter. For the rest the revision is rather piecemeal and the new parts are often tacked onto the old without any adjustment of the old, as for instance in the advice relating to interplanting with soft fruits on page 35. There is also considerable repetition in the advice given and one wonders if the time is not near when the whole book should be rewritten. The work is a

mine of information and covers the whole subject from buying the land to storing and marketing the fruit. It is unique in attempting to present costings of all operations and devotes a whole chapter to the important subject of Finance and Records. The chapter on grading and packing gives a particularly clear account of these essential jobs. With some of the other chapters, especially V stocks, IX pollination, XII pests and diseases and XIV reheading and top grafting, we find many points with which we cannot agree, as the advice given runs counter to the results of careful experiments. It is unfortunate that the chapter on stocks should open by damning with faint praise the work of research stations, for however much these remarks may have been justified when the earlier editions appeared and the work was in its infancy, they surely require some modification nowadays. It is to be hoped that the intelligent reader will not expect to find the whole truth about rootstocks and their effects in this chapter. More reference to the basic work of Mr. M. B. Crane on cross-pollination could usefully have been made in chapter IX, and this would have avoided the recommendation of combinations of cherries that are known to be fruitless, such as Elton with Governor Wood and Frogmore with Waterloo. In chapter XII control measures of proved worth are given alongside others of doubtful value, without any warning to the reader that these latter must be used with caution. Thus quassia extract is claimed to eliminate an established attack of aphis and other pests and a nicotine lime dust is said to dispose of woolly aphis. The reference to carriers of virus diseases is at variance with the known facts. The chart of blossom stages, figure 24, might well have been brought up to date in accordance with the names recently published by the Ministry of Agriculture. The description of stub-grafting in chapter XIV, although alleged to be derived from East Malling Research Station, bears little resemblance to the method developed there. Some of the revisions have been almost too simple, thus in figure 6 a change in title from "bush apple tree" to "dwarf pyramid apple tree" has brought an old block up to date. Incidentally the captions to figures 13 and 14 have become mixed so that an obvious spring tooth harrow is labelled a disc harrow and *vice versa*. In spite of these criticisms, many people will find this book a valuable reference work and every fruit grower should have a copy on his shelf, even if he takes some of the advice with a grain of salt. H.B.S.M.

921. TAYLOR, H. V. 634.11(42)
The apples of England.
Second edition, Crosby Lockwood & Co., London, 1945, pp. 205, bibl. 46, 21s.

The first edition of this work, which appeared in 1936 (*H.A.*, 1936, 6: 612), has been considerably enlarged in this, the second edition. Many new varieties have been added in place of older varieties of little value and the photographic illustrations, six more than in the previous edition, now include most of the important commercial varieties. A suggested list of choice garden varieties, as well as of suitable commercial varieties, is given, and a short list of varieties reputed to withstand frost fairly well. But possibly the most useful addition, especially important to those who attempt to name fruit, is the key to varieties, which closely follows the workable plan used by Bunyard in his Handbook of Fruits. This book is indispensable to all those who are interested in apple varieties, whether they grow them or eat them, and will remain a standard reference book until the appearance in English of an up-to-date, fully illustrated work on the lines of the Herefordshire Pomona or Dahl's Pomologi (see abstract 913). A few small printer's errors have escaped the proof reader, thus the paging in the list of contents on page 9 is incorrect as regards the last six entries, while as touching the illustration Fig. 5, Devonshire Quarrenden, the reviewer prefers the "after the lithograph" of the first edition to "after the lithographic" of the second. H.B.S.M.

922. THOMPSON, C. R. 634.11-1.542
Modern apple tree pruning.
Second edition, Headley Bros., 109 Kingsway, London, 1943, reprinted 1944, pp. 48, 2s.

The second edition of this useful manual, reviewed *H.A.*, 11: 1016, remains essentially unaltered. Some of the illustrations are more clearly presented and a short, loose table makes for quicker reference. May one suggest that the author should now help us to prune other kinds of fruit?

923. WALLACE, T. 632.19: 633/635
The diagnosis of mineral deficiencies in plants. A colour atlas and guide. Supplement.
H.M. Stationery Office, London, 1944, pp. 48, 5s. net.*

The supplement follows the same lines as the original publication (see *H.A.*, 13: 1089) with the addition of a useful index of crops included in colour plates in the original edition and the supplement. The supplement contains 95 coloured plates, 4 of which are to replace an equal number in the original edition. W.A.R.

924. WILLIS, L. G. 631.811.9: 016
Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition.
Fifth supplement to the third edition. Chilean Nitrate Educational Bureau Inc., 120 Broadway, N. York, 1944, pp. 95.

In addition to the various indices given in previous supplements, namely General, Author and Botanical, an Animal Nutrition index is included here for the first time.

925. CANADA. 634/635(71)
Report of the Minister of Agriculture, Canada, for the year ended March 31, 1944, 1944, pp. 186, 50 cents.

The report gives concise accounts of the many activities of the Ministry, including the work of 31 branch farms and experiment stations. Some notes of the horticultural work are of interest. At Kentville, N.S., severe outbreaks of scab were controlled. At St. Catharine's, Ont., brown rot of peaches was shown to be dependent on weather conditions. An extensive survey has been made of Canadian plants as a supplementary source of rubber. Much attention has been given to the selection and propagation of high-yielding strains of kok saghyz. Substantial progress has been made towards the development of the vigorous large-rooted plants high in rubber, on which the ultimate utilization of kok saghyz depends. Polyploid plants of kok saghyz have been produced by the use of colchicine. At Saanichton, B.C., the dusting of tulips with copper-lime dusts during wet periods of the season greatly controlled tulip fire. A significant reduction of botrytis rot of onions was the result of immersing the bulbs for 1 or 2 hours in water at 110°-114° F. containing 0·5% formalin. Cuthbert raspberry has been replaced by Washington in the raspberry industry of B.C., planting stocks of Cuthbert being hopelessly contaminated with virus. Summerland, B.C. reports that boron applications to the soil of B.C. are completely efficient in eliminating boron deficiency diseases. In plant chemistry the work has principally been on dehydrated vegetables and in particular on the effect of processing and storing on vitamin retention. Work on fruit insects has been carried on at several laboratories. In Nova Scotia "knubby berry" of strawberries has been traced to the mirid bug *Calocoris norvegicus*. At Fredericton, N.B., a close correlation was found between the severity of strawberry weevil and the amount of snow cover in individual plantations. Results with many wartime substitute insecticides are reported. Two additional codlin moth parasites obtained from Great Britain were liberated in southern

* The main volume and the supplement may also be obtained bound as one volume for 15s. net (by post 15s. 6d.).

Ontario. Investigation of stored product insects has been actively continued.

926. National Research Council of Canada. 633.913
Twenty-seventh Annual Report of the N.R.C., 1943-44, being *N.R.C.* **1243,** pp. 32, [in English] +pp. 34 [in French].
Nearly the whole work of the Division of Applied Biology was related to the war effort. The following paragraph is of interest to horticulturists: " A great deal of work was done on the development of methods for the extraction of natural rubber from native and introduced plants that could be grown in Canada. In addition, some of the associated fundamental problems on natural rubber production were supported at the University of Toronto and assistance was obtained from Queen's University in the translation of Russian scientific literature on the subject. A pilot plant for the extraction of rubber was erected and began operations during the year. To meet the needs for these studies the Department of Agriculture undertook to supervise the collection of dried milkweed leaves by the schoolchildren of Ontario. Large quantities of milkweed rubber-resin were made available for blending tests with synthetic Buna S."

927. Canada, Department of Agriculture (Nunnick, F. C.). 016: 63(71)
List of publications of the Dominion Department of Agriculture, revised January 1945, pp. 19.
Attention is drawn to the existence of this list, which is revised annually and is obtainable from the Director, Publicity and Extension Division, Dep. Agriculture, Ottawa.

928. Ceylon, Rubber Research Board. 633.912
Report of the work of the Rubber Research Board in 1943, 1944, pp. 34.
Bud grafts were taken from 20 trees yielding very hard and very soft rubbers which have maintained their plasticity characteristics over 2 years, in order to determine whether these characteristics can be transmitted to the vegetative progeny. The question is important since parent trees are to be selected for special qualities in their rubber. Marked differences have been found in clonal susceptibility to canker of the renewing bark of budded trees. Regular application of the standard estate disinfectant at increased concentration prevented serious damage. Once the disease has passed the initial stages excision of the damaged bark is a safer cure than painting. Manioc, planted among rubber, is useful as an indicator of *Fomes lignosus* root disease, if the tubers are carefully inspected at time of harvesting. If the disease is overlooked successive plantings of manioc in infected ground may lead to an alarming spread of the disease among the *Hevea* trees. The 6th year of the tapping experiment at Dartonfield on mature seedling rubber shows an increase for the year of 26·5% for the double-three plots (2S/2, d/3, 133%) over the control (S/2, d/2, 100%) and an average annual increase over the 6 years of 20%. As a temporary means of increasing production the method justifies adoption. Results are also given for a number of intensive tapping systems. An extra yield of 34 lb. per acre was obtained from areas tapped during the winter rest period. Upward tapping, i.e. a cut progressing up the tree instead of down, was suggested in a recent idea competition sponsored by the Rubber Research Board. The idea had already been tried at Dartonfield and has value as a temporary device in cases of trees which cannot be tapped on the normal panel owing to brown bast or thin bark. In various manurial experiments on young trees only small responses were obtained, except on a steep gravelly replanted area at Dartonfield where a 40% girth increase response was obtained with 4-year-old budded stumps from both organic and inorganic manures. The unusually good response was attributed to sparsity of cover and the application of manures every other month during the early growth period.

929. Ceylon, Tea Research Institute. 633.72
Annual Report of the Tea Research Institute of Ceylon for 1943, 1944, being *Bull.* No. **25,** pp. 64.
Phloem necrosis spreads more rapidly as elevation increases. Above 6,000 feet the percentage incidence of the disease may be doubled in a year. At high elevations the total incidence may amount to 25%. Bushes attacked should not be removed until they have become unproductive. In experiments with the shot-hole borer the number of breakages in a 7-month period of the 2nd year after pruning rose to 6 times that of the corresponding period in the 3rd year. The effect of manures in increasing growth was to increase the number of breakages from borer, a result which is quite contrary to the opinion held before these experiments started. Although the number of breakages so greatly increased on the highest yielding plots, the loss of crop from this cause was less than the increase from manuring. Manurial experiments have now completed four three-year pruning cycles. Nitrogen markedly improves yield but has little effect on the nitrogen content of the leaf. Potash applications increase the content in the leaf but have little effect on yield. Phosphoric acid has very slightly more effect on leaf composition than on yield. The Institute's recommendation of incremental doses throughout the cycle are confirmed and it is made plain that adequate manuring of tea has a cumulative effect of lasting value. In the course of selection work 74 selected clones have now been planted in the field, but have not yet reached the plucking stage for final yield tests. The most promising of the green manures has been *Sesbania cinerescens. Tephrosia eriosemoides* and *Cytosus proliferus* are slow growers at St. Coombs but merit further trial. Work was continued on the nature of the enzyme system of tea and some interesting results have been obtained on the influence of the enzymic copper content on fermentation. The Mycologist's report discusses *Poria hypolaterita* root disease, horse hair blight (*Marasmius equicrinis*), eelworms, phloem necrosis. The Entomologist deals chiefly with shot-hole borer, tea tortrix (*Homona coffearia*) and its parasite *Macrocentrus homonae* and the nettle grubs *Natada nararia, Parasa lepida* and others with their parasites. The nettle grubs are armed with stinging hairs which cause intense irritation and the distress caused to the labour staff is greater than the damage to tea. Weeding and cultivation experiments are in progress in order to find an alternative policy to clean weeding, in the interests of soil erosion control and the maintenance of soil fertility. Reduced yields were shown due to weeds but they were negligible by the 3rd year, intensive cultivation also gave consistently lower yields throughout, but with a diminishing effect. The relatively small crop losses due to weeds show that weeds do not necessarily prejudice the utilization of fertilizers by the tea. Hasty generalizations are not to be drawn from these results, which are given in the report in some detail.

930. Florida. 634/635
Annual Report Florida Agricultural Experiment Station for the fiscal year ending June 30, 1942, pp. 216+vi.
Reports are furnished of a very large number of projects undertaken by the different departments and at the several substations and laboratories. One or two of horticultural interest are noted below. Response to soil treatment for iron deficiency of tung trees was irregular. Symptoms of manganese deficiency of tung were apparent only in dry weather and disappeared with the rains, whether the trees were treated or not. Decided superiority in yield was confirmed for tung trees from selected as compared with unselected stock. Ultra-violet rays, infra-red rays and X-rays all controlled penicillium in stored citrus fruit. Infra-red rays had little effect on stem-end rot, but short-time exposure to X-rays caused great reduction of the disease. Comparison between 1,000 Pineapple oranges of good taste and of poor taste showed that fruit of good taste excelled in

size, weight, specific gravity of fruit and of juice, deeper colour of rind, per cent. acid, per cent. total sugars, per cent. protein in peel, seed, rag and juice and per cent. vitamin C. Poor tasting fruit was higher in per cent. ash in juice, per cent. seed, deeper colour of juice and per cent. protein in juice. Zinc oxide applied to the soil was effective but slower than zinc sulphate in obtaining response to rosette leaf in pecans and less effective than zinc sulphate when used as a foliage spray. Pecan nuts treated with 0·001% naphthaleneacetic acid and indolebutyric acid developed seedlings with better root systems than those treated at different concentrations or with other growth substances.

931. Florida. 634/635+634.85
Annual Report Florida Agricultural Experiment Station for the fiscal year ending June 30, 1943, pp. 224.

Reports are furnished on a very large number of projects of which a few of horticultural interest are noted below: Soil application and spray of copper sulphate corrected a characteristic cupping of the leaves observed in certain tung orchards. Roots of individual plants of kok saghyz yielded from 2·10% to 8·18% rubber on muck soils and from 3.95% to 8·5% on mineral soils. Pliofilm wrapping 20 gauge+cold storage kept car lot shipments of tangerines, limes and grapefruits 3 times as long as no treatment. Pliofilm without cold storage was also effective, though to a less degree. Exposure to X-rays before and after pliofilm wrapping controlled stem-end rot of oranges without fruit injury. Histological and morphological phases of the maturity of citrus fruit were studied and recorded by camera lucida drawings and microphotographs. The origins of the fruit tissues such as juice sacs, seed, button, rind, were traced and their changes correlated with the maturity or aging of the fruit. The percentage of total pectic compounds in the albedo and pulp increases gradually, then remains constant during a long period and finally begins to decline in the early ripe stage. One-year-old tung trees, *Aleurites montana*, were mainly killed to the ground by a temperature of 22° and 26° F. in March, whereas at 30° F. and 31° F. no trees were injured. Dipping the roots of pecans in ·01% naphthaleneacetamide or indolebutyric acid resulted in the development of good lateral roots in 58% and 52% of the survivors of the treatment against 8% in those not dipped. Top growth was unaffected. Tung trees planted with whole tops and roots 3 ft. or more in length made more vigorous growth than those dug and transplanted in the ordinary commercial manner. Special reports included concern the work of the Sub-tropical and Citrus stations.

932. Gold Coast Colony. 633/635(667)
Report on the Department of Agriculture, Gold Coast, for the year 1943-44, 1944, pp. 10, 1s.

The maintenance and increase of production as a maximum war effort both to feed the people of the country and the forces and, in the case of rubber, palm kernels and copra, for export, has been the chief agricultural policy. Considerable advances in organization have been achieved and there has been no shortage of food worthy of note. Cocoa prices were stabilized at railway buying centres and transport charges to the ports paid by the Produce Control Board. In connexion with swollen shoot problems the Botanist visited Trinidad to obtain a wide range of cacao types, some of which might prove resistant to capsid and swollen shoot. Many pods were received and the seed sown in quarantine. Special research has had to be undertaken into the chronically diseased condition of certain lime farms and into the cause of the dying off of increasing numbers of budded citrus of all kinds on the variety plots at Asuansi. Planting of coconuts continues in suitable districts. Disease, however, is spreading, and all affected trees are now required to be reported and destroyed. The production of *Funtumia* rubber has greatly increased and the export was the highest on record. These readily accessible trees cannot in future be expected to produce more than a third of the initial yield and it will be necessary to organize work in outlying areas. Schools for training tappers and gang-leaders have been established. The output of plantation *Hevea* has been maintained. Exports of palm oil kernels were 2½ times greater than the previous year, the prices offered having been considerably increased and extensive propaganda carried on.

933. Dirección General de Marruecos y Colonias. 633/635(669.91)
Anuario agrícola de los Territorios españoles del Golfo de Guinea. **(Annual report on agriculture of the Spanish Territories in the Gulf of Guinea.)** *Publ. Dir. agric. Territ. espan. Golfo de Guinea* **6,** 1942, pp. 118.

This annual report on the agriculture of the Spanish possessions in the Gulf of Guinea, consists of 3 articles dealing with the following subjects: (1) *Araceae of Fernando Po* (M. L. Gomez-Moreno), both wild and cultivated, with many illustrations and a bibliography (18). (2) *Longicorn beetles* injurious to some cultivated trees, especially to cocoa and coffee in Spanish Guinea (L. Baguena). Systematic characters, life history and control of a number of large wood boring beetles of the genera *Stenodontes*, *Sternotomis* and *Tragocephala* and of *Bixadus serricola* are discussed. The illustrations include some fine coloured plates of the insects. (3) *Climatology of Spanish Guinea for 1941* (J. Nosti), including many coloured maps and charts.

934. Illinois State Horticultural Society. 634.1/8
Transactions of the Illinois State Horticultural Society for 1943, being Vol. 77, 1944, pp. 520.

This contains numerous rather general papers by experts on most phases of horticulture in Illinois. Among subjects of more than local interest are the following:—The peach industry and its problems in Illinois and other Central States in the years 1920-1940; blueberry cultivation; biennial bearing and its partial control by blossom thinning by means of sprays; new trends in fruit storage, e.g. use of controlled atmosphere, wraps and dips; corrugated paper apple boxes; effects of fertilizers and pruning on fruit production.

935. John Innes. 634/635
Thirty-fifth Annual Report of the John Innes Horticultural Institution 1944, 1945, pp. 24.

During the course of the year serious damage was received from flying bombs. The losses included that of the medlar graft hybrids and the spoiling of the greater part of the year's breeding work. *Pomology Department.* Attention is drawn to abnormalities in the Lord Lambourne apple known as rubbery wood and chat fruit and occurring when that variety is grafted on certain other kinds of apple. It appears probable that these abnormalities are of the same kind as those found when King Edward potato is grafted on to other potato varieties and produces disease effects. They would appear to arise directly by grafting, i.e. from the invasion of one variety by the proteins of another. Lord Lambourne affords the only example noted as yet in apples. Other work concerns the possible control of virus in raspberries by use of hybrids, disease resistance in tomatoes, new kinds of tomatoes, the origin of self-fertile radishes. *Genetics Department.* Observations are recorded on the isolation requirements of turnip, radish, barley, French bean, beet and maize. It is found that "in out-pollinated species, whether by wind or insects, contamination falls off rapidly with distance at first, but over greater distances the fall is more gradual. In wind-pollinated plants the fall in contamination nevertheless clearly continues up to the greatest distance used, but in insect-pollinated plants this is not so. There is, in fact, no evidence of a reduction in the small amount of contamination in the radish, for example, over distances from 160 to 580 ft. This remarkable conclusion has great practical importance, and further experiments must be carried out."

Garden Department. Some of the results are described in the John Innes Bulletin [first number just received.—ED.] and only brief accounts are given here. Results of seedling investigations are summarized as follows:—Better growth and more rapid development are secured by pricking-off earlier than is customary; by eliminating potting-off so far as that is possible; and by the use of large as against small pots. Early fruiting in tomato is directly correlated with rapidity of development, therefore all these factors must be considered if an early crop is wanted. The quality of the compost or soil used in raising seedlings has a more potent effect on the final crop than is generally realized. On the other hand, pricking off seedlings into cold soil or watering with cold water do not appear to be detrimental, as is commonly supposed, at least not with a good compost. Other work discussed concerned the use of peat on onion, spinach (favourable), lettuce and carrot (unfavourable) and of leaf mould (various) on tomato, lettuce and tobacco. Hoeing on a sandy loam removed weeds but otherwise was a waste of time. It was found that good composting did not destroy tobacco mosaic virus, but compost made of infected material did no harm when used as a dressing for outdoor tomato plants.

936. MADRAS, DEPARTMENT OF AGRICULTURE. 634.1/8(548)

Report on the work of the agricultural stations in the Madras Presidency for 1942-3, 1944, pp. 438.

The reports in which this Bureau is interested are those of the fruit stations at Coonoor, Burliar, Kallar and Kodur. *Coonoor*. Altitude 5,800; temperature 87° F. to 39° F. There was ground frost on 5 occasions. In the apple trials a note was taken of degrees of resistance to woolly aphis, which is the limiting factor to the successful cultivation of apples on the Nilgiri hills. Irish Peach is reported as immune, Signe Tillisch as resistant. Carrington and Zouche's Pippin were not attacked, Edward VII is mildly susceptible, Winterstein and Allsops Early are susceptible and Rome Beauty is most susceptible, besides being a shy bearer. The other apples are described as prolific except Edward VII which bears moderately. Merton rootstocks 778, 779, 789 and 793 suckered fairly freely in the layering beds, had small stem girth, started growth early and were entirely free from woolly aphis. Malling stocks had larger stem girth, started growth late, were less prolific and generally susceptible to woolly aphis. Merton 793 appears to be a relatively poor type. Small trials with various methods of budding and grafting were made. Shield budding does not appear to have been very successful. Crab apple suckers and Malling stocks gave 25·5 and 27·6 successful takes respectively, the Merton stocks did not take at all. The only method of pruning apples at Coonoor has been to remove the dead wood and cross limbs. In a small pruning trial tipping back leaders and laterals resulted in the largest production of flushes and blossom and was superior to the local method. Notching above every dormant apple bud in May resulted in 95% of the treated buds putting out new shoots within a fortnight. Plum stock trials have revealed certain incompatibilities. Attempts to root the country pear from cuttings gave at best only 8·4% success. Attempts to bud Jargonelle pears on quince A and C failed completely. Whip grafting was up to 80% successful, if carried on in February, but failed altogether when done in October. In a pruning experiment with persimmons tipping back the previous year's growth increased the crop. Thinning grapefruit to 25 per tree on a site which always produced undersized fruit resulted in large increases in fruit size. *Burliar*. Altitude 2,300 ft. Climate warm and humid. Experiments were made of budding the mangosteen on *Garcinia mangostana* and *G. tinctoria* by the Jafna method (not described) monthly from November to May (except December). All buds still green a month later were considered to have taken, but despite this only one could be induced to start growth, even ringing proving unsuccessful. Side grafting mangosteen was quite successful on *G. mangostana* in April, May and November. *G. tinctoria* takes, but the scions fail to start. Budding and grafting jack fruit (*Artocarpus integer*) failed with all methods tried, except shield budding, and then only 10% succeeded. The hill papaya *Carica candamarcensis* as stock was successfully inarched to *C. papaya* (65% success) in November, December and April. The plants could be separated from the parent tree in 2 months. Grafting mangos by the Nakamura method (greenwood side grafting, *H.A.*, 1939, 9: 1428) was fairly successful, Peter, a variety which had always failed to respond at Kodur, here giving 41% success. Tongue and ring layering and marcotting of litchi was highly successful. Shield budding failed. Durian (*Durio zibethinus*) was budded and grafted in various ways. A moderate percentage of buds took but would not start. The results of the grafting are not given. *Kallar*. Altitude 1,400 ft., warm, humid. Mangosteens 2½ years old with stem diameter of 0·56 to 0·80 cm. were fairly successfully side grafted on site. Buds also took but failed to start. All mangosteens on the station had hermaphrodite flowers with sterile male organs. The fruit was, therefore, parthenogenetically produced. Tipping back the leader is proposed as a possibly profitable pruning practice with this plant. Mangosteen cuttings failed to root, although set in a variety of media in every month of the year. Seeds of several mangosteen species of possible value for rootstocks were sown. Germination was moderate. Seeds which have the endocarp removed or are even slightly injured do not germinate. *Kodur*. In the citrus and mango tract within 100 miles of Madras (altitude is not given) the citrus rootstock trials were obscured by various root and stem diseases. Gajanimma (*Citrus pennivesicula* Tanaka) was very disease-susceptible. It seems to be a useful stock for acid lime as regards weight of crop produced. Chinee orange budded on *Feronia elephantum* fruits in clusters of 5 and 6 fruits each, only a few being borne singly. Chinee orange on *Atalantia monophylla* have not yet fruited (planted 1939). Trials in relation to effect of various methods of vegetative propagation on tree performance of mango gave no significant results. From field observation a trial between rootstocks from polyembryonic and monoembryonic seedlings indicated that the polyembryonic stocks consistently induced greater scion vigour.

937. MASSACHUSETTS. 634/635(744)

Annual Report Massachusetts Agricultural Experiment Station for 1943-44, 1944, pp. 78, being ***Bull. 417.***

Short summaries are given of the observations made and other work of the station. Some projects of horticultural interest are noted here. Study of disease of plants caused by soil infesting organisms and control measures. Creosote injury to plants. Control of cabbage club root with chloropicrin (nothing significant, after years of work, has been found in favour of chemicals applied to the field in advance of planting). Chemical investigation of the onion. Phosphorus compounds in certain vegetables. Ascorbic acid content of late-winter tomatoes (one-third that of summer tomatoes). Castor bean extractives as insecticides (show promise as a contact spray). Control of onion thrips (Dinitro dust reduced attack 91%. Slight burn followed heavy application. Standard combined spray of nicotine sulphate and soap gave 90·2% reduction). Control of cabbage maggot (Early Jersey and Wakefield definitely resistant). Effect of insecticides on honey bees (fluorine compounds fully as toxic as arsenicals. Dusts of rotenone, pyrethrum, nicotine, sulphur and DN toxic in that order. DN did not cause appreciable mortality). Spraying tomato flowers with a growth hormone in the greenhouse (flowers sprayed during winter months with a solution of orthochlorophenoxypropionic acid 50 mg. per litre of water. Ovaries of sprayed flowers twice as large, fruit mostly seedless and yield markedly greater). Lethal incompatibilities

between clonal stocks and varieties of apples. Nature of winter hardiness in raspberries (starting into growth of terminal buds is due to polarity and not to differences in rest period. Winter injury is apparently not due to canes drying out). Controlled atmosphere storage of apple (McIntosh apples kept better, 7 months, in controlled atmosphere storage, 2% oxygen at 40° F., than at ordinary 32° F. cold storage. Ordinary scald was severe only on apples picked early and held at 50° F. until placed in controlled atmosphere storage. Wrapping with oiled paper controlled scald perfectly. Soft scald was probably due to low oxygen, was more prevalent on later picked fruit especially if highly coloured, and not affected by wrapping). Thinning apples and peaches with caustic sprays.

938. Middle East Supply Centre. 63: 063(516)
The Proceedings of the Conference on Middle East Agricultural Development, being *Agric. Rep.* 6, Middle East Supply Centre, 10 Sharia Tolumbat, Cairo, 1944, pp. 220, 5s.

The first session of this Conference was devoted to existing practice in Middle East Agriculture as touching irrigation and dry land farming. Thus papers dealt with irrigation in Egypt, the Levant States, Cyprus, and with dry farming in parts of Palestine, Egypt and Aden. The second session was devoted to a consideration of what was possible of achievement by reclamation and development of new land—papers dealt with possibilities in the hill Delta, the Middle Euphrates Valley, in Syria and with sandy soil treatment in Egypt. At the third session the prevention of waste of agricultural resources was considered, chiefly that brought about by erosion and river silting, illustrations being given from Cyprus, Palestine and Lebanon. A further session was devoted to the means by which research results should be brought to practical use in agricultural problems and it included a short, interesting account of the activities of the agricultural research station at Rehovoth since its foundation in 1921. Much attention is given at that station to the growing and processing of fruits including deciduous, sub-tropical and citrus.

939. New York State. 634.1/8(747)
63rd Annual Report New York State Agricultural Experiment Station for the year ended June 30, 1944, Geneva, N.Y., 1945, pp. 62.

The report contains numerous, brief summaries of results obtained in the different Divisions. The following notes concern a few of the current investigations. Bacteriology and Chemistry.—Various aspects of food preservation are considered. Plant Protection.—The yam bean (*Pachyrhizus erosus*) has been found to be a source of rotenone. Laboratory studies of the ovicidal efficiencies of the pure acid 4,6 dinitro-*o*-cresol and a number of its salts in comparison with the efficiencies of commercial preparations show that the spray concentrations now recommended are unnecessarily high. In moderately infested orchards nicotine added to sulphur lead arsenate dusts greatly increased their efficiency against codlin moth. Reports are given on the control of the following diseases: rust of apples by Fermate, cherry leaf spot by copper-containing mixtures, blotch, scab and *Mycosphaerella* leaf spot of pears by Elgetol, spur blight of raspberries by Elgetol and Fermate. Petroleum oil sprays applied to dormant and semi-dormant trees often retard development by decreasing the respiration of the buds proportionately to the heaviness of the deposit. The addition of dinitro insecticide sometimes caused injury, possibly because, being soluble in oil, it enters the buds with the oil. Pomology.—Various methods were tried of rooting Malling apple rootstocks. Root cuttings made in March and started in the greenhouse could be budded in late August, thus saving one year. Malling I, IX, IV, VII, XIII root fairly well from basal portions of hardwood cuttings, II and XII less readily, median and tip sections root less well and different clones respond differently to growth substances. In U.S.A. Malling stocks do well if given attention, but will not tolerate neglect. The Malling stocks withstood —38° F. in the Hudson River Valley. McIntosh does best on M. I and Cortland on M. XIII, but no incompatibility between leading U.S.A. apples and Malling stocks has yet shown itself. Results obtained by the Divisions of Seed Investigations and of Vegetable Crops are also recorded.

940. Nigeria. 633/635(669)
Annual Report of the Agricultural Department, Nigeria for the year 1943, 1944, pp. 34, 1s. 6d.

The report is largely concerned in detailing the efforts of the Department to obtain maximum production in the country in all branches of agriculture likely to help the war effort. Until February 1944 the Department was largely responsible for army supplies. A report on the Oil Palm Research Station shows that the work there consists of breeding and selection experiments, on cultivation methods and on methods for the improvement of extraction and processing. The urgently needed manurial experiments cannot be started until artificial manures are again available. An important spacing experiment has been laid out to determine the optimum spacing for palms grown either as the sole crop, or with intercropping or with cattle grazing in the groves. A root disease caused havoc in the palm nursery and is now being studied. The isolated plots of white-seeded kola are now bearing chiefly white nuts. The presence of a few red or pink nuts may be due to errors at the original pollinations. The size of the bean in Nigerian cocoa was found to be an inherited character. *Arabica* coffee scions have been budded and grafted onto *liberica* and *robusta* stocks. It is hoped that stock influence may enable *arabica* to be grown at a lower altitude than is normally suited to it. Great improvements have been made in the quality of locally grown *Hevea* rubber and it is hoped that as a result the industry may compete successfully in the post-war market. The newly started cinchona plantations now contain nearly a million and a half plants in 4 varieties, namely *Cinchona succirubra ledgeriana, josphina* and a *succirubra/ledgeriana* cross. Owing to pests and diseases the cocoa production was the lowest for 9 years. [The work of the new Cocoa Research Station has been reviewed elsewhere in *Horticultural Abstracts.*—Ed.] Bornu Province contains areas which seem suited to date palms and small trial plantations have been established. Citrus nurseries have been established in most provinces and distribution of budded trees has begun. Owing to improvements in the curing system leading to increased demand the 1944-45 tobacco area is to be increased to 400 acres from 280 acres.

941. Oregon State Horticultural Society and Western Nut Growers Association. 634/635
Annual Reports of the Oregon State Horticultural Society and of the Western Nut Growers Association, 1943, 1944, pp. 139.

The bureau has recently received a batch of these reports, covering the war period and a short time before. Incidentally several articles in the 1942 report have already been abstracted, *H.A.*, 14: 86, 477, 570 and (635). While the paper of the 1943 report is thinner, the size remains much the same and it, like previous numbers, contains many practical articles of particular interest to the man on the spot and often of more than passing interest to the outsider faced with similar problems. Among such articles are the following:—The Eastern Oregon wild plum (*Prunus subcordata*) [possibility of selecting for growth where less hardy plums fail]. Experiments on vegetable seed production in Oregon. Control of wild morning glory by cultural practices. Progress with the mechanical filbert harvester. Preliminary report on the use of boron on walnut trees (*Juglans regia*).

942. PALESTINE. 634.1/8(569.4)
Annual Report of the Palestine Department of Agriculture for the year ended March 31, 1944, being No. **S.5,** 1944, pp. 9.

Useful results [unnamed] are now being obtained in the fruit tree rootstock trials. Research work on citrus fruit wastage was continued. *Pseudococcus comstocki* on citrus appears to have been largely controlled by the liberation of 80,000 chalcid parasites, *Clausenia purpurea*, though new centres of infection were found. Mango has now been added to the host list of this mealy bug. Black scale, *Chrysomphalus aenidum*, on citrus was well controlled with three mineral oil sprays. Lead-arsenate residue was found difficult to remove from the felty skin of peaches but not from plums.

943. RHODE ISLAND. 634/635(745)
Fifty-sixth Annual Report of Rhode Island Agricultural Experiment Station for 1943. **Wartime agricultural research,** being *Contr.* **659,** 1944, pp. 46.

Vegetables. Variety trials with many types are in progress. Other projects concern the use of cover crops, the vitamin content of different types and varieties within the type, and the pretreatment, chemical and otherwise, of roots prior to storage. *Fruit.* A report is given of an extremely promising material, available as Puratized N_6X, for controlling apple scab. It is reported as inexpensive, compatible with insecticides, non-injurious to foliage and fruit at the dilutions used, equally potent in acid or alkaline water and effective at dilutions of 1: 5,000 to 1: 10,000 in water. The next most effective anti-scab material, Isothan Q4, also proved effective for washing apples to remove poisonous residues and for protecting them against blue mould soft rot in storage. Tests are in progress on the effect on storage life of wrapping apples with different kinds of paper, of dipping them in different sorts of wax emulsion and of varying humidity and temperature at the beginning and end of the storage season. *Fungicides.* It is noted that the best of several generic groups of antiseptics which the station has recently helped to develop is a by-product of the coking of coal. A second promising group has been found among the "quaternary ammonium" compounds, while a third group, including Puratized N_6X, being investigated are members of a new type of organic mercury compounds. Further a "service" fungicidal test has been worked out whereby in 2 weeks' time the "staying power" of a chemical can be forecast. The test chemical is placed on specially treated glass slides which are buried in moist greenhouse soil. At intervals the slides are removed and the ability of fungous spores to germinate on their surface is observed. *Foods.* Investigations concern dehydration, quick freezing and vitamin loss during processing. Quick freezing was found superior to dehydration for the retention of carotene as well as of ascorbic acid.

944. WÄDENSWIL (MEIER, K.). 634.1/8
Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1941 und 1942. **(Report of the Wädenswil Horticultural Research Station for the years 1941 and 1942.)**
Landw. Jb. Schweiz., 1944, **58**: 417-95.

A considerable proportion of the results summarized in this report have been published elsewhere and have already been noted in *Horticultural Abstracts.* I. Fruitgrowing. *Rootstocks* (K. Meier, W. Bryner). All rootstock trials in progress are tabulated; data for standard (apples, plums and zwetschen, cherries) and dwarf trees (apples, pears, peaches, apricots, zwetschen) are presented with particulars on locality, variety, rootstock (including stem builders), number of trees, date of planting. *Pollination—conditions in Swiss orchards* (F. Kobel). The original article was published as *Flugschr.* No. 16, new edition, and in *Obstbau und Bienenzucht. Beih.* No. 3 *Schweiz. Bienenzeitg.* 1942, 1: 111-54, see *H.A.*, 10: 877. *Pests and diseases.* The timing of winter washes (R. Wiesmann). Several years' experiments have shown that the efficacy of anthracene oil containing fruit tree carbolineum against winter moth and aphid eggs rapidly declines, if applied after the beginning of March. The development of the eggs, which offers an explanation for these results, is described. In view of the different timing required for the treatment against winter moth and scab the combined winter wash is deprecated. *Spray injury* (C. Hadorn). Chemical tests and biological comparison of different copper sprays have shown that the content of water-soluble copper and the alkalinity of the solution are the main causes of injury from copper-containing spray mixtures. A storage disease in Glockenapfel (A. Osterwalder), reminiscent of scab, was found to be caused by *Gloeosporium album.* Spots are the first symptoms of the *Gloeosporium album* rot, which is easily recognizable in its later stages. A new disease of Rigi cherries (A. Osterwalder), which greatly reduced the yields in 1942, was proved by means of inoculation experiments to be caused by a bacterium, presumably a *Pseudomonas* species. Shiny, olive-green, fatty spots on the fruits are the symptoms appearing in the course of June. II. Utilization of Fruit. *Storage.* A constant temperature of 4° C. was found to be the most favourable temperature for the storage of Belle de Boskoop (H. Kessler). *Fruit wines* (A. Widmer, F. Braun). A method is described by which sugar is replaced by grape juice or fruit juice concentrates. For the prevention of acetic acid and lactic acid fermentation sulphur was added before the alcoholic fermentation began, the latter being started by additions of ammonium sulphate and of pure yeast. Three grades of wine were produced with an alcohol content of 6, 7-8 and 11-14 Vol. % respectively. III. Viticulture. *Soil analyses* (K. Meier). A survey of viticultural soils made in 1941 and 1942 shows that an acid reaction is very rarely met with and that about 29% of the soils were deficient in available phosphate and potash (21·7% in 1942). *Technical experiments* (E. Peyer, H. Huber). Since the unfavourable year of 1939 chlorosis has spread to an alarming extent in many vineyards. Painting the vines with iron vitriol and citric acid in various concentrations did not bring any relief, while drainage with clinkers gave good results in a heavy wet soil. In order to test the possible effect of the rootstock on chlorosis, large-scale trials with a number of rootstocks and varieties were started in collaboration with viticulturists. Results are not yet available. Certain direct producer varieties, which have done well in Western Switzerland and in France, are now propagated in the Station's nursery. S-V 5-276 has been the best white variety, while others have suffered from mildew and/or rot or have not matured properly. Further results are given of some trials with American rootstocks propagated and distributed by the Station. Applications of carbon disulphide by means of injection and of a complete fertilizer, both as a top dressing and by means of a fertilizer lance, failed to produce any visible improvement in old vine nursery soil. A brief account is given of the progress made in the building up of clones of Blauburg grapes selected for yield and health. *Pests and diseases.* Among the free-living nematodes *Criconema rusticum* excites special interest, as it was present in all of the more than 100 vine root samples examined. It is believed that this nematode may have a certain significance as a root parasite contributing to the chlorosis and degeneration of vineyards (R. Menzel). The percentage of vine leaves carrying winter (oo-)spores of *Peronospora viticola* are recorded for a number of varieties. IV. Market gardening. *Soil analyses* (K. Meier). A survey of market garden soils made in 1941 and 1942 shows that acid reactions occur very rarely and that very few soils are deficient in lime. The percentage of soils deficient in phosphoric acid and potassium amounted to 43·1 and 50·7 respectively in 1941 and to 46·9 and 32·5 in 1942. *New varieties* (F. Kobel, F. Schütz). A brief report is given of the propagation of a new strain of *Primula malacoides*,

namely strain 8, *Rosea gigas*, of selected strawberry hybrids and of several new vegetable varieties. *Pests* (R. Wiesmann) and *diseases* (C. Hadorn). The pest *Contarinia torquens* was controlled on *Brassicae* plants by several applications at weekly intervals of a well wetting, soapless, nicotine spray (0·5% nicotine [15%]+0·2% Sandovit). The first treatment should be given in the seedbox shortly before planting out. With cauliflower, savoy and red cabbage spraying should be continued until the head begins to form. Complete control of the leek pest, *Acrolysia ascetella*, was obtained by repeated sprayings or dustings with D.D.T. When studying the carrot fly, *Psila rosae*, it was found that another fly, *Phytomyza catnalis*, causes very similar damage to the crop and must therefore be regarded as a carrot pest. Control of the first generation of both flies was achieved by 5 applications of a 0·2% fruit tree carbolineum, 2 litres per m^2. A reduction of the second generation from 82·8% to 11·8% was obtained by 5 treatments, at fortnightly intervals, with the fruit tree carbolineum Veralin at a concentration of 0·2%, 4 litres per m^2. The spray will depress yields by about one-third. The testing of different copper spray mixtures led to the recommendation of 5 preparations for the control of various vegetable diseases. The organic copper dust Bulbosan is reported to have given excellent results against tomato leaf-mould, caused by *Cladosporium fulvum*. The second part of the report is devoted to an account of activities other than research, such as advisory, plant protection, classes, publications, etc.

945. WASHINGTON. 634/635(797)
54th Annual Report Washington Agricultural Experiment Station for fiscal year ended June 30, 1944, 1944, pp. 168.

The report covers all agricultural activities. Only horticulture is noticed here. Many seed production trials with spacing as a chief study are reported. Attempts to root peach and apple cuttings after preliminary wrapping on the tree with black insulating tape and subsequent immersion for 18 or 7 hours in 100 p.p.m. of various common growth substances resulted in good callusing but, at time of reporting, no rooting. The heat of the tape killed many twigs. Winter injury seemed less severe on heavily pruned trees when the pruning was deferred till after the low winter temperatures had passed. Some favourable results were obtained by pollen inserts in the bee hives. On irrigated land, 2 years after tree spacing by removal, 24 apple trees per acre produced 113% as much fruit as 48 trees per acre had done. Fruit drop caused by high temperatures followed by high wind just before harvest time was in no way influenced by irrigation. Injection of Beurré d'Anjou pears with the micro-nutrients copper, boron, iron, manganese and zinc, or the addition to the soil in separate treatments of 15 lb. per tree of KCl, MgCl, $CaCl_2$ had no effect on the incidence of cork spot of the fruit. Application of nitrogen and phosphorus slightly increased yield of asparagus beds. Time of application of N seemed immaterial. Sweet cherries (Bing and Lambert) can be stored at 32° F. for 2 or 3 weeks without loss of quality. Apricots stored at 46° F. suffered from breakdown and mould spoilage within a few days. At 32° F. storage life was extended to about 14 days, but there was rapid loss of flavour and quality and total breakdown 24 hours after removal to room temperature. Apples washed with 1·50 HCl at 95° F. lost more moisture than unwashed fruit, the addition of 1% concentration of mineral oil reduced dehydration and the addition of a further 5% caused shrivelling. Wrapping in rubber composition wrappers and sealing greatly reduced dehydration during storage and after, but more rots developed, and sealed wraps developed an off flavour which was not present in loosely wrapped fruit. The report of the cranberry-blueberry laboratory is included.

946. The following reports have also been examined: (10)

A.R. Dep. Agric. B. Guiana for 1943, 1944, pp. 12.

A.R. Dep. Agric. British Honduras for 1943, 1944, pp. 14.

13th A.R. Minist. Agric. Eire, 1943-44, 1944, pp. 77, 3s. 6d.

A.R. Fla agric. Exp. Stat. for 1939-40, pp. 213.

A.R. Fla agric. Exp. Stat. for 1940-41, pp. 207.

14th A.R. Dep. Agric. Mauritius Sugarcane Research Station, 1943, 1944, pp. 17, 50 cents.

Bienn. Rep. Okla. agric. Exp. Stat. 1942-44, parts I and II, pp. 95 and 23, sub-title Science serving agriculture, 1944.

54th Phenological Report, 1944, published by Roy. Met. Soc. (Gunton, H. C.), being Supplement *Quart. J. roy. met. Soc.*, Vol. **71,** *Phenological Number*, 1945.

A.R. agric. Dep. St. Vincent, B.W.I., for 1942, 1944 pp., 10.

A.R. agric. Dep. St. Vincent, B.W.I., for 1943, 1944, pp. 12.